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8 June 2022

Mr. Benjamin Baccash
2 Hudson Square Associates, LLC
c/o Taconic Development Company, LLC
111 Eighth Avenue, Suite 1500
New York, New York 10011

RE: Geotechnical Investigation Report
Proposed 2 Hudson Square Development
New York, New York
Langan Project No.: 170470002

Dear Ben:

As you are aware, Langan had performed a geotechnical subsurface investigation and a site-specific seismic study at the above-referenced project site in July and November 2017, respectively. The subsurface investigation generally consisted of performing 11 drilled borings and 4 seismic cone penetration test (SCPT) probe borings, and installing 6 groundwater level observation wells at the site. As requested and in general accordance with our 19 December 2019 (revised 3 February 2020 and updated 7 December 2021) proposal, we have prepared this geotechnical investigation report. This report summarizes our understanding of the existing site conditions and the currently proposed development scheme, presents the findings from the 2017 subsurface investigation, and provides our foundation design recommendations for the currently proposed development scheme. Our recommendations regarding other geotechnical aspects of the proposed construction, such as excavation, dewatering, temporary support of excavation, and protection of adjacent structures, are also provided herein. Please note that the July 2017 investigation drilled borings satisfy the 2014 New York City Building Code (NYCBC) minimum subsurface investigation requirements for the currently proposed development scheme.

PROJECT DESCRIPTION

Site Conditions

We understand the subject site (the "Site") consists of Tax Lot 63 on Block 227, and is an approximately 33,000-square-foot parcel located in Manhattan, NY; refer to Figure 1 for a Site location map. The Site is currently vacant, and is bordered by Canal Street to the south, Duarte Square to the east, Grand Street to the north, and Varick Street to the west. New York City Transit (NYCT) subway tunnel structures associated with the 1, 2, 3 lines and A, C, and E lines are located below Varick Street to the west and below Avenue of the Americas (a.k.a. 6th Avenue) to the east of the site, respectively. In addition, Sullivan Street, which has been de-mapped, is currently located along the eastern portion of the site. An about 32-foot-wide New York City Department of Environmental Protection (NYCDEP) easement is located along Sullivan Street in the eastern portion of the site.

We reviewed the 22 May 2017 (revised 13 July 2020) site survey prepared by our office. This survey indicates the sidewalk and site grades are relatively level, with surface elevations ranging from about el 8 to about el 10. Note all elevations in this report are in reference to the North American Vertical Datum of 1988 (NAVD88).

Adjacent NYCT Structures

There are two NYCT structures within close proximity to the project site: the 1-2-3 subway line along Varick Street immediately west of the site and the A-C-E subway line along Sixth Avenue, about 25 to 100 feet east of the site.

NYCT record drawings indicate the base of rail of the 1-2-3 subway line structure varies between about el -14 and about el -15.5 adjacent to the site. Ventilation vaults with grates extend up to the sidewalk level along Varick Street, and an entrance to the 1-2-3 Canal Street station abuts the site along Canal Street.

NYCT record drawings indicate the base of rail of the A-C-E subway line structure varies between about el -16 and about el -23.5 in the area relatively closer to the site. A pedestrian tunnel, associated with the A-C-E subway station reportedly exists below Sixth Avenue. The tunnel reportedly traverses north from Canal Street station beneath Sixth Avenue and then splits into two branches running east and west. The west branch of the tunnel extends below Duarte Square and Sullivan Street into the eastern portion of the Site; this portion of the pedestrian tunnel (passageway) is reportedly abandoned.

Our office previously performed a 3D laser scan of all accessible areas of the above-mentioned pedestrian tunnel and this information was presented in an 8 August 2019 Memorandum. The laser scan data indicates the roof of the pedestrian tunnel is at about el 5 near its western end and at about el 0 below Sullivan Street and Duarte Square; these elevations correspond to about 3 to 8 feet below existing surface grades in these areas. The top of slab of the pedestrian tunnel reportedly varies from about el -2.6 to about el -8.5. The stairway at the west end of the pedestrian tunnel, that would daylight within the site, has been covered at grade.

Proposed Development

Based on the 18 May 2022 Design Development set of drawings prepared by SHoP Architects and DeSimone Consulting Engineers (the Structural Engineer), we understand the currently proposed development scheme consists of constructing a 27-story tower. The first floor of the podium will have a footprint area of about 23,500 square feet, and will house commercial retail space and a school. The school will also occupy the next four levels of the podium. The tower levels above the podium will be office space. No basement level is presently contemplated. The tower will have a core in the northern portion of the Site. The proposed building will be set back from the east property line by about 38 feet. We understand the superstructure will rise about 430 feet above the sidewalk level and the top of the first floor level slab will vary between el 9 and el 12. Most of the column foundation caps will extend no deeper than el 2.5, except for isolated columns in the northern portion of the building where the foundation caps may extend as deep as el 1. In the core area, the bottom of foundation cap elevation is expected to range between about el 4 and about el -4. Individual column compression, uplift, and lateral loads are anticipated to generally range between about 1,000 and 3,000 kips, about 250 and 1,000 kips, and about 20 and 40 kips, respectively.

A future NYCT subway entrance, with an elevator and stairs leading to the subway station platform, is proposed in the southwestern portion of the site along Varick Street. Based on discussions with the Project Team, we understand the lowest structural member of this subway entrance structure will extend about 25 to 30 feet below grade. At this time, it is anticipated that this subway entrance will be constructed many years after the new building has been completed; the exact NYCT construction schedule is not known. In addition, a new below-grade NYCDEP pump station is proposed along Sullivan Street. The excavation and construction of this pump station are anticipated to commence after foundation construction of the proposed building has been completed, but are anticipated to occur concurrently with building superstructure construction.

Available Information Review

We reviewed the latest Site survey, and obtained and reviewed available historic Sanborn, geologic, and topographic maps for the Site area. We also researched and reviewed the latest Federal Emergency Management Agency (FEMA) flood mapping for the Site area. The following paragraphs generally summarize the relevant available information:

- Site Survey – The 22 May 2017 (revised 13 July 2020) survey prepared by our office indicates several below-grade utilities exist along the streets adjacent to the Site. These include:

    - About 48-inch x 48-inch and 57-inch x 51-inch combined sewer mains along Grand Street and Avenue of the Americas, respectively.

    - A 28-inch x 42-inch combined sewer main below the Varick Street sidewalk between the Site and the NYCT subway tunnel structure.

    - Three 12-inch, 18-inch, and 48-inch combined sewer mains, an 8-inch gas main, and 12-inch and 20-inch water mains below the sidewalks and streets surrounding the Site.

  Several other features, such as fire hydrants, light poles, tree pits, grates, and vaults, also exist along the sidewalks and streets surrounding the Site.

- Historic Sanborn Maps – The historic Sanborn maps indicate the site was previously occupied by three 3-to-7-story buildings from the 1920s until all site buildings were demolished around 2007. We expect that portions of cellars walls and slabs of these buildings were left in place and filled in using demolition debris from the buildings' superstructures. We note that earlier buildings may have occupied the site prior to construction of the 1920s buildings.

- Bedrock Map (Refer to Figure 2) - A 1994 bedrock and engineering geology map prepared by the United States Geological Survey (USGS) indicates the predominant bedrock type in the Site area is Manhattan Schist. More specifically, this formation is described as gray sillimanite-muscovite-tourmaline schist.

- Historic Sanitary and Topographic Map (Refer to Figure 3) - An 1865 historic sanitary and topographic map of New York City prepared by Egbert Viele indicates the site area was originally occupied by marshland. The area was subsequently filled above the marsh for development of this portion of Manhattan.

- FEMA Flood Insurance Rate Map (Refer to Figure 4) - The FEMA Preliminary Flood Insurance Rate Map, Community Panel Number 3604970182G (preliminary as of 5 December 2013), indicates the site is located within a 1% annual chance flood plain with a base flood elevation at el 10.

GEOTECHNICAL SUBSURFACE INVESTIGATION AND FINDINGS

Subsurface investigation

Our July 2017 geotechnical subsurface investigation and November 2017 site-specific seismic study consisted of performing 11 drilled borings (identified as LB-1 through LB-11) and 4 seismic cone penetration tests (identified as SCPT-1 through SCPT-4), and installing 6 groundwater level observation wells (identified as MW-1 through MW-6) at the site.

The borings were drilled between 15 June and 6 July 2017 by Craig Geotechnical Drilling Co., using a truck-mounted drill rig. The SCPT probes were performed between 17 and 18 October 2017 by ConeTec, Inc. Refer to attached Figure 5 for a location plan showing approximate locations of the drilled borings, SCPT probe borings, and groundwater level observation wells.

Conventional mud-rotary drilling techniques were used to advance all the borings through the subsurface soil to top of rock. Standard Penetration Test (SPT) procedures were used to obtain soil samples near-continuously in the upper about 12 feet of the borings in general accordance with the provisions of ASTM D1586. An automatic hammer was used to drive the SPT split-spoon sampler for the borings. Once rock was encountered, the borings were advanced into rock using a 5-to-10-foot-long, NX-sized double-tube core barrel fitted with a diamond bit. Conventional rock coring was performed in each boring typically in 5-foot runs to boring termination depth. The soil and rock samples were classified in the field by our field engineers in general accordance with the Unified Soil Classification System and the NYCBC.

The borings were backfilled using soil cuttings and patched at the surface. In addition, six groundwater level observation wells were installed as part of a separate environmental investigation performed by Langan. These wells consisted of about 10-foot-long, 2-inch-diameter, slotted-screen PVC pipes installed across the water table, with 2-inch-diameter, solid PVC pipes above extending to the ground surface. The annulus of each borehole was backfilled to about 2 feet above the screened interval using filter sand; above this level, a 1-foot-thick hydrated bentonite seal was installed and the remainder of the annulus was backfilled to grade with sand and clean drill cuttings. Each well was finished with an expanding well plug. Groundwater levels were recorded in these wells by our on-site field engineers during the 2017 investigation fieldwork.

The SCPT probe borings were performed using a truck-mounted rig by hydraulically advancing an about 2-inch-diameter instrumented cone penetrometer through the subsurface soil. At three of the SCPT probe boring locations, pre-drilling was required through the upper few feet of fill in order to advance the cone probe. The SCPT probe borings were advanced until cone refusal, which typically occurred between about 40 feet and about 70 feet below grade. In addition, seismic shear-wave velocity measurements were performed in all four SCPT probe borings at about 3-foot intervals to probe termination depth. Upon completion, the SCPT probe borings were backfilled using bentonite hole-plug and patched at the surface.

All subsurface investigation activities were performed under the full-time special inspection of a field engineer from our office. Our field engineer performed the inspections under the direct supervision of a NY-State-licensed Professional Engineer from our office, as required by the NYCBC.

SUBSURFACE CONDITIONS

Drilled Boring Observations

The drilled boring data indicates the subsurface conditions at the Site generally consist of miscellaneous fill mixed with demolition debris overlying successive strata of medium-dense sandy soils and bedrock. A thin layer of clay and peat was encountered in three of the borings performed at the site, just below the fill stratum. Drilled boring profiles, showing generalized subsurface conditions encountered at each boring location, are presented as Figures 6 and 7. Boring logs are included in Attachment A. The SCPT probe boring report provided by ConTec is included in Attachment B. The following paragraphs generally summarize the observed soil, rock, and groundwater conditions.

Miscellaneous Surficial Fill

A stratum of miscellaneous fill, consisting of brown-to-red coarse-to-fine sand, mixed with gravel, brick, and concrete fragments, was encountered in all the borings. The fill extended about 7 to 18 feet below ground surface and was observed to be generally in a very loose to dense condition, as evidenced by SPT N-values typically ranging from 3 to 48 blows/foot. Isolated relatively higher SPT N-values typically ranging from 83 blows/foot to refusal (over 100 blows/foot) were observed in many of the borings within the fill stratum. Borings LB-2 and LB-8 were relocated to avoid obstructions encountered around 10 to 15 feet. Additionally, in borings LB-1, LB-4, LB-7, LB-9, LB-10, and LB-11, difficult drilling, split-spoon refusal, or concrete fragments in the sample were encountered at depths around 10 to 15 feet. The difficult drilling conditions indicate large obstructions near the bottom of the fill stratum, which are likely the remnants of the former buildings' cellars slabs / foundations and demolition debris used to backfill the cellars.

The miscellaneous fill is classified as NYCBC Class 7 material in accordance with NYCBC requirements.

Peat and Clay

A thin layer of peat was encountered in test borings LB-3, LB-5, and LB-6 drilled in the northeast quadrant of the site. The peat layer was encountered below the fill at depths ranging between about 10 and 20 feet, and was observed to be about 5 feet thick. The black peat included wood fragments. The peat was observed to be generally in a very soft to firm condition, as evidenced by SPT N-values typically ranging from 1 to 6 blows/foot.

In boring LB-3, a 5-foot-thick layer of gray, silty clay was encountered below the peat. The SPT N-value in the silty clay was 11 blows/foot, indicating stiff material. Atterberg Limits test was performed on a representative sample to determine the Plasticity Index (PI) of the silty clay. A PI of 4 was determined, indicating low plasticity silty clay.

The peat is classified as Class 6 material in accordance with NYCBC requirements. The silty clay is classified as Class 4b material in accordance with NYCBC requirements.

Sand

A sand stratum was encountered in all of the borings underlying the fill and/or the peat/clay layer, where encountered, and extending down to bedrock. The sand stratum was observed to range from about 53 feet to about 80 feet in thickness in the borings.

The stratum consisted of reddish-brown, medium to fine sand, with varying amounts of silt. The SPT N-values above a depth of about 50 feet ranged from weight of hammer (WOH) to 9 blows/foot, indicating very loose to loose material. The SPT N-values below a depth of about 50 feet ranged from 10 to 50 blows/foot, indicating medium dense to dense material.

Grain size tests were performed on four representative samples from the sand stratum. The grain size distribution indicated the samples were primarily fine sand with fines content (passing the No. 200 sieve) by weight ranging from 14 to 40 percent.

The upper portion of the sand stratum is classified as Class 6 material, and the lower portion of the sand stratum is classified as Class 3b and 3a material in accordance with NYCBC requirements.

Cobbles and Boulders

It is important to note that in 5 of the 11 borings (LB-4, LB-6, LB-8B, LB-9, LB-11) performed at the site, obstructions were encountered during drilling at depths ranging from 48 to 64 feet; these obstructions were encountered within the lower portion of the sand stratum described above. Split spoon refusal and drilling difficulty indicated the presence of very dense material or potentially cobbles and boulders ranging from about 6 inches to over 1 foot in dimensions.

Bedrock

Bedrock was cored in all the borings between about 68 and 93 feet below grade. The top of bedrock was observed to be sloping downwards from south to north. Bedrock consisted of gray schist with coarse to fine particles of muscovite, quartz, and feldspar, and with steep to shallow-dipping slightly weathered to fresh fractures. Rock Quality Designation (RQD) values ranged from 25% to 100% and were typically around about 85%, indicating generally good quality rock. Table No. 1 summarizes rock coring information for all test borings.

Table No. 1. Bedrock Coring Summary

Boring	Ground Surface Elevation	Depth to Bedrock (feet)	Core ID: Recovery (%)	Core ID: RQD (%)
LB-1	9.5±	93±	C-1: 92 C-2: 97	C-1: 77 C-2: 90
LB-2D	9.5±	90±	C-1: 90 C-2: 100	C-1: 82 C-2: 100
LB-3	9.6±	89±	C-1: 100	C-1: 92
LB-4	9.0±	88±	C-1: 95 C-2: 100	C-1: 85 C-2: 95
LB-5	9.2±	88±	C-1: 90 C-2: 90	C-1: 85 C-2: 83
LB-6	8.6±	86±	C-1: 98 C-2: 90	C-1: 98 C-2: 83
LB-7	8.8±	87±	C-1: 95 C-2: 95	C-1: 78 C-2: 95
LB-8B	8.9±	74±	C-1: 97 C-2: 97	C-1: 83 C-2: 88
LB-9	9.0±	69±	C-1: 87 C-2: 97	C-1: 67 C-2: 97
LB-10	9.0±	80±	C-1: 93 C-2: 100	C-1: 88 C-2: 100
LB-11	9.3±	67±	C-1: 47 C-2: 47 C-3: 87	C-1: 25 C-2: 36 C-3: 75

Groundwater

Groundwater was measured in the observation wells about 10.5 to 11.5 feet below surface grade within a few days of well installation in 2017. Table No. 2 summarizes the groundwater level data.

Table No. 2. Groundwater Level Summary

Monitoring Well ID	Approximate Ground Surface Elevation	Depth to Groundwater (feet)	Groundwater Elevation
MW-1	9.5±	11.2±	-1.7±
MW-2	8.7±	11.4±	-2.7±
MW-3	9.1±	10.9±	-1.8±

MW-4	8.7±	10.5±	-1.8±
MW-5	8.7±	10.6±	-1.9±
MW-6	9.3±	11.1±	-1.8±

These groundwater levels are 3 to 5 feet lower than where groundwater is typically encountered in this area close to the Hudson River. The relatively lower groundwater level measurements can be attributed to groundwater pumping being performed at the nearby NYCT subway tunnel structures. These groundwater levels should be confirmed by means of test pits prior to beginning excavation and foundation construction activities at the site.

Laboratory Testing

As part of the 2017 investigation, select soil samples obtained from the drilled borings were sent to a specialty laboratory for the following engineering property testing:

- Five (5) water content determinations (ASTM D2216),
- Five (5) grain size distribution analyses (ASTM D422),
- One (1) Atterberg Limit determination (ASTM D4318).

The laboratory test results are included in Attachment C.

FOUNDATION DESIGN RECOMMENDATIONS

At this time, we understand the currently proposed development scheme consists of constructing a 27-story building with no basement level. Therefore, the proposed building foundations are expected to bear within NYCBC Class 7 surficial fill and NYCBC Class 6 loose sandy soils. These soils are not considered suitable for foundation support. Medium dense or better sandy soils (i.e., NYCBC Class 3b/3a material) were encountered in the borings below the loose sandy soils. However, we anticipate these soils will not have sufficient capacity to support the relatively high column and shear wall loads from a 27-story tower without allowing significant foundation settlements. Therefore, building loads should be transferred below these unsuitable soils and into bedrock using a deep foundation system. Considering the proximity of the NYCT structures and other adjacent potentially vibration-sensitive structures, and the need to simultaneously resist significant compression and uplift loads, we recommend the use of drilled rock-socketed caissons.

Our recommendations for a deep foundation system are provided in the paragraphs below.

Deep Foundation Support

Caissons should consist of a steel casing drilled at least 6 inches into the NYCBC Class 1c or better rock, a sufficiently long rock socket of the required diameter extending into Class 1c or better rock, grout/concrete fill, and full-length centralized steel reinforcement. The caissons should be properly designed using the allowable stress requirements in the 2014 NYCBC and constructed such that no adverse impacts to adjacent structures and utilities result. Prior to reinforcement and grout/concrete placement, the rock sockets and the cased sections above should be completely cleaned of all debris and rock cuttings and the rock socket conditions should be visually inspected and approved by a qualified special inspector.

We understand from the Project Structural Engineer that individual compression, tension, and lateral capacities summarized in Table 1 below are desired.

Table 1: Caisson Capacity Requirements

Compression Capacity (tons)	Tension Capacity (tons)	Lateral Capacity (tons)
500	125	20
750	200	20
850	200	20
1,000	300	40
1,250	350	40
1,500	500	40

Our corresponding caisson design recommendations are summarized in Tables 2 and 3 below. Note that the caisson designs presented below account for a steel corrosion loss allowance of 0.125 inch.

Table 2: Rock-Socketed Caisson Design and Compression / Uplift Capacity Summary

Design Compression Capacity (tons)	Caisson Design Summary						Design Uplift Capacity (tons)
	Steel Casing (min 36 ksi)	Rock Socket		Steel Reinforcement		Grout(G) or Concrete(C) Fill (psi)	
		Min Dia (inch)	Min Length (feet)	Full Length	Additional in Socket		
500	Min. 16" O.D. x 0.5" thick	14	10	(2) #24 bar (75 ksi)	(1) #24 bar (75 ksi)	10,000 (G)	125
750	Min. 16" O.D. x 0.5" thick	14	15	(3) #28 bars (75 ksi)	(1) #28 bar (75 ksi)	10,000 (G)	200
1,000	Min. 24" O.D. x 0.5" thick	22	13	W12x152 (50 ksi)	N/A	8,500 (C)	300
1,250	Min. 24" O.D. x 0.5" thick	22	16	W12x170 (50 ksi)	(2) #28 bars (75 ksi)	8,500 (C)	350
1,500	Min. 24" O.D. x 0.5" thick	22	19	W12x170 (50 ksi) & (1) #28 bar (75 ksi)	(3) #24 bars (75 ksi)	10,000 (C)	500

Table 3: Design Lateral Capacities for Caissons

Caisson Type	Fixed-Head Lateral Capacity (tons)				Min. Required Fixed-Head Caisson-to-Cap Moment Capacity (ton-ft)
	Single	1st Row	2nd Row	3rd + Row	
16-inch-diameter Caissons	12.5	11	7.5	6	90
24-inch-diameter Caissons	24	22	14.5	12	245

The caissons should be spaced at a center-to-center spacing of at least 3 times the casing outer diameter. The above-mentioned single-caisson lateral capacity should only be used for caissons spaced at a center-to-center spacing of at least 6 times the caisson outer diameter. The minimum required fixed-head caisson-to-cap moment capacity given in the above table is not factored; a sufficient factor of safety should be accounted for by the Project Structural Engineer in the pile-to-cap connection design. Provided rock socket video inspections are performed in the field during construction to confirm the minimum required socket lengths in NYCBC Class 1c or better rock have been achieved, caisson compression and uplift load testing will not be required to verify caisson load-carrying capacities. However, caisson uplift versus deformation behavior may need to be verified by means of uplift load tests. Field lateral load tests will be required to substantiate caisson lateral load-carrying capacities greater than 1 ton per element.

If relatively higher caisson axial capacities are desired, such higher capacities can be achieved using larger diameter casings, additional steel reinforcement, higher strength grout fill, and larger and longer rock sockets. Relatively higher caisson lateral capacities can be achieved by using larger diameter and/or thicker steel casings. We can provide supplemental recommendations for relatively higher capacity caissons, if desired. Group uplift analysis will be required to confirm caisson socket lengths once the caisson layout and loading have been finalized.

Deep Foundation Settlements

For a properly constructed deep-foundation-supported building, we anticipate foundation total settlements would be less than 1 inch, and differential settlements would be less than 0.5 inch.

Seismic Design

A preliminary seismic evaluation of the drilled boring data was performed using the 2014-NYCBC-prescribed procedure and the more advanced Youd et al (2001) procedure. The NYCBC defines liquefiable zones as any soils having a factor of safety against liquefaction less than one for Structural Occupancy Category (SOC) II and III structures. Our initial liquefaction potential assessment was based on comparison of the Cyclic Stress Ratio (CSR, driving force causing liquefaction) to the Cyclic Resistance Ratio (CRR, force resisting liquefaction). An earthquake magnitude (M) of 5.5 was used for the analysis per the United States Geological Survey (USGS) Earthquake Hazards Program database. In addition, site-specific peak ground acceleration (PGA) of 0.33g, corresponding to Site Class E, was used for the analysis in accordance with the 2014 NYCBC provisions. Soil gradation and consistency (including percent fines and plasticity characteristics) were also considered. The initial liquefaction analysis showed that the loose submerged sands are potentially liquefiable between 15 and 45 feet below grade. Therefore, per the 2014 NYCBC requirements, the Site was classified as having Site Class F due to the presence of liquefiable soils, and a site-specific seismic study was required to refine the liquefaction potential assessment and develop site-specific seismic design parameters to assist in structural design.

A detailed site-specific seismic study was subsequently performed using the boring data and advanced computer modeling software programs Shake2000 and D-MOD2000. The analysis was performed in accordance with the provisions of the 2014 NYCBC and ASCE 7-10. This analysis indicates that although complete liquefaction of the subsurface soils is unlikely, partial liquefaction of soils between 10 and 50 feet below grade and soil strength loss due to such partial liquefaction should be taken into account in foundation design. The following table summarizes the excess pore water pressure (EPWP) ratio values recommended for foundation design.

Depth Below Ground Surface (feet)	Recommended EPWP Ratio
Zero to 10	0%
10 to 20	30%
20 to 30	40%
30 to 35	95%
35 to 50	40%
50 to 90	0%

Based on the site-specific seismic analysis, the following seismic design parameters are recommended for building design:

Design Parameter	Value
Final Seismic Site Class	Class F
Design Spectral Accelerations at Short Period and at 1-Second Period	S_S = 0.320 (short periods) S_1 = 0.093 (1-second period)
Seismic Design Category, SDC, for Risk Category I, II, or III Structures	B

Below-grade Walls and Floor Slabs

The Site is located within the 1% annual chance floodplain, and the base flood elevation is determined to be at el 10. Per NYC Local Law 43, year 2021, the design flood elevation should be at least 2 feet above this level (i.e. at or above el 12). The 0.2% annual-chance flood level and the potential for sea-level rise over time due to climate change should also be taken into consideration when determining the final design flood elevation for the proposed building.

To comply with the flood zone requirements in the NYCBC, any foundation walls extending below the design flood elevation should be fully flood-proofed. Where dry-flood-proofing is used, the foundation walls should be designed to resist hydrostatic pressure corresponding to the design flood level. As a minimum, a positive-side waterproofing membrane should be installed behind any building walls around dry floor-proofed areas and extending below the design flood level, and water-stops should be placed at all associated below-grade joints. New building walls located above the design flood elevation can also be waterproofed or constructed with a vapor barrier for additional moisture protection, if desired.

The below-grade walls should be considered fixed against rotation, and should be designed to resist lateral soil, hydrostatic, and surcharge loading. Based on the results of the site-specific seismic study, we anticipate the proposed building will be in seismic Design Category B. For structures in Design Category B, the NYCBC does not require dynamic earth pressure to be considered in foundation wall design. Any foundation walls along the adjacent streets should be checked for a temporary water level near street grade in case a water main break was to occur along the streets. Surcharge loads from adjacent sidewalks, roadways, construction equipment, and staging should be considered in below-grade wall design. We recommend that permanent surcharge loads from any adjacent structure foundations that are located above a 1H:1V theoretical line extending upwards from the bottoms of the new building foundation walls should also be accounted for. A schematic diagram showing how to apply the above lateral design loads is attached as Figure 8.

We recommend lowest-level slabs be designed as structural slabs spanning between adjacent foundations, and should be designed to resist hydrostatic pressure arising from the above-mentioned design flood level. The structural slabs should also be designed to support below-grade utilities, which should be hung from the structural slabs using corrosion-protected hangers. A continuous waterproofing membrane should be installed beneath all slab areas located below the design flood elevation. As a minimum, a membrane-type vapor barrier should be installed beneath all lowest-level floor slabs located above the design flood elevation.

OTHER GEOTECHNICAL CONSIDERATIONS

NYCDEP Interaction

As previously discussed, an NYCDEP pump station will be constructed along Sullivan Street to the east of the site. The excavation and construction activities associated with the pump station are anticipated to commence after completion of new building foundation construction, but are anticipated to occur concurrently with new building superstructure construction. Therefore, we anticipate coordination between the two projects will be required. At a minimum, we recommend that the pump station excavation, dewatering, excavation support construction, and foundation construction activities should be designed and performed in such a manner so as not to cause any loss of ground, loss of support, or other adverse impacts to the new building.

NYCT Interaction

For NYCT structures located within 200 feet of new construction sites, NYCT requires that project plans be submitted for their review and approval. Therefore, we anticipate the Project design documents, such as the geotechnical report, site survey, and foundation and temporary excavation support drawings, will need to be submitted to NYCT for review and approval. We anticipate NYCT approval of the Project construction documents will be required before NYCDOB foundation construction permit can be issued for the project. In addition, the existing conditions of the NYCT subway structures will need to be documented prior to start of excavation activities at the site, and the structures will need to be properly monitored for vibration levels and movements during on-site excavation and foundation construction work. We anticipate NYCT will also require the project developer to carry a project-specific Railroad Protective Liability insurance policy.

Coordination with NYCT will also be required with respect to the proposed subway entrance easement. We anticipate Project design drawings showing the easement details and any related drawings showing below-grade improvements to be installed as part of on-site excavation and foundation construction activities, such as foundation and excavation support drawings, will need to be submitted to NYCT for review and approval. We anticipate NYCT approval of the easement documents will be required before NYCT's formal approval of the foundation and temporary excavation support drawings for the project can be obtained.

Excavation and Dewatering

Because a basement level is not currently proposed, we anticipate most of the foundation excavations will extend 5 to 7 feet below the existing Site grade. However, it will be necessary to excavate portions of the Site up to about 12 to 15 feet below the existing sidewalk level to construct the core-area foundation caps and the associated elevator pits. These excavations will extend several feet below the static groundwater level.

Excavation through fill and underlying soil deposits can be performed using conventional soil excavation equipment. Remnants of former building foundation elements are likely present in the fill, and will need to be removed and properly disposed of if encountered during excavation.

We anticipate excavations to about 2 feet above the static groundwater level can be performed with relatively minor rainwater and perched water pumping and discharge. Below the static groundwater level, a significant dewatering effort will be required to lower the groundwater level sufficiently below the bottom of the core-area pile caps and pits, so that excavation and construction of these elements can be performed in relatively dry conditions. On-site groundwater lowering / pumping can influence groundwater level beyond the site limits and could potentially cause settlements and adverse impacts to adjacent structures and utilities, including the NYCT subway tunnel structures. Long-term dewatering is also likely to influence regional groundwater flow characteristics and potentially attract undesirable impacted groundwater from surrounding areas towards the Site. Therefore, as discussed in the subsequent section of this report, we recommend a properly designed closed sheeting system be installed around such relatively deeper excavations extending below the groundwater level.

All excavated soil and pumped groundwater generated during foundation excavation should be properly disposed off-site per the applicable NYSDEC and NYCDEP regulations, and any project-specific environmental requirements, including NYC OER requirements. Any underground storage tanks (USTs) associated with former on-site buildings, if encountered, should be removed and disposed of, along with any impacted fill, soil, and groundwater, per applicable NYSDEC and NYCDEP regulations. Dewatering effluent will need to be properly treated, if necessary, and discharged into the City sewer system in accordance with the applicable City and State environmental regulations. We anticipate a temporary NYCDEP sewer discharge permit will be required prior to commencing dewatering operations. Contractor's calculations regarding the estimated dewatering effluent volume will be required to obtain this permit. Note that the

NYCDEP limits the amount of temporary dewatering effluent entering into the City sewer system, and charges per-gallon fees for discharge of dewatering effluent into the City sewer system. NYCT's approval of the proposed dewatering system will also be required.

Temporary Excavation Support

We anticipate on-site excavations for pile caps can be performed using stabilized sloping and benching techniques; excavation side slopes should not be steeper than 1.5H:1V. Where space constraints prevent the use of sloping and benching, we anticipate timber sheeting or a conventional soldier piles and lagging system can be used to provide temporary excavation support.

At deeper excavations around the core area, a closed sheeting system, designed to provide an effective groundwater cut-off, should be constructed. The sheeting system should be selected considering the potential for encountering subsurface obstructions and the vibration-sensitive nature of the neighboring structures. At this time, we anticipate the closed sheeting system around the core area can consist of a soil-cement-mix wall with conventional soldier pile reinforcement. The closed sheeting should be designed and constructed to extend sufficiently below the proposed excavation level to create an effective groundwater cut-off. Groundwater levels within and outside the sheeting should be carefully monitored during excavation and foundation construction to confirm excessive groundwater lowering is not being caused in the adjacent areas due to the dewatering operation. If such groundwater lowering is observed, suitable modifications to the closed sheeting system and dewatering means and methods should be made to avoid adverse impacts to the adjacent properties.

The excavation support systems should be designed with sufficiently rigid lateral bracing to resist the surcharge loads, soil loads, and hydrostatic pressure without undergoing excessive deformation that can cause adverse impacts to the neighboring / bordering structures and utilities. The excavation support systems should be properly installed with excavation performed in front of these systems, so as not to cause soil deformations or loss of ground from underneath the neighboring / bordering structures, sidewalk, streets, and utilities.

The NYCBC requires that site-specific plans and details be prepared for temporary excavation support systems. These details should be designed by the Excavation Contractor's Professional Engineer licensed in the State of New York. We recommend exploratory test excavations / probes be performed at the Site to expose the neighboring NYCT structures at select strategic locations, as necessary, so that information regarding these structures could be used to prepare site-specific excavation support plans and details. Information regarding street and sidewalk utilities should be obtained, reviewed, and incorporated in the temporary excavation support system design along all sides of the Site, so that active utilities can be avoided during construction.

Signed and sealed support of excavation design drawings should be submitted to Ownership for review and to NYCDOB and NYCT for filing and approval. NYCBC requires that an independent NYCDOB-approved Special Inspection Agency directly engaged by Ownership perform special inspection of the excavation support systems.

Excavation Support in the NYCT Easement Area

In the NYCT easement area, a 25-to-30-foot-deep excavation is anticipated in the future to construct the proposed NYCT elevator and stair structure. We anticipate the support of excavation system around the easement area will need to be one of the following closed sheeting systems or a combination thereof:

- A properly reinforced secant or tangent pile wall
- A properly reinforced soil-cement-mix wall with conventional soldier pile reinforcement
- Pushed-in steel sheet piles

If a secant pile wall is used, we anticipate it can be incorporated as a permanent foundation wall for the NYCT subway entrance structure. If a tangent pile, soil-cement-mix, or sheet pile wall is used, a permanent reinforced concrete foundation wall will need to be constructed inside the support of excavation system.

Considering the significant depth of the anticipated excavation, multiple levels of internal bracing are expected to support the excavation support system. The excavation support system will need to be sufficiently rigid and installed, with excavation and NYCT structure construction performed within, very carefully so as not to allow any loss of ground or support from beneath the on-site new building or the adjacent NYCT subway tunnel structure. In addition, the excavation support system should be sufficiently watertight and extended to a sufficient depth below the proposed excavation level to create an effective groundwater cut-off, so that any required dewatering inside the easement area excavation can be performed without causing groundwater level to drop beyond the excavation limits.

The NYS-licensed Professional Engineer and the excavation and foundation contractor engaged by NYCT should be responsible for properly designing and constructing the support of excavation system as indicated above. The above discussion has been included in this report only for the benefit of the Project Team, and a more detailed discussion regarding the NYCT easement area excavation or excavation support system design and construction is considered beyond the scope of this report.

Protection of Adjacent Structures

All on-site excavation, support of excavation construction, dewatering, and foundation construction work should be performed carefully so as not to adversely impact or cause loss of support to the neighboring NYCT tunnel structures, buildings, other structures, sidewalks, streets, and utilities. We recommend performing pre-construction conditions documentation of select exposed and accessible areas of the neighboring buildings, subway tunnel structures, and streets and sidewalks. As a minimum, we recommend the pre-construction conditions documentation should consist of a photographic documentation of exposed and accessible portions of the adjacent NYCT structures (interiors and exteriors) within 50 feet of the Site. In addition, we also recommend the existing conditions of accessible portions of neighboring building exterior facades, sidewalks, and street areas within at least 100 feet of the Site should be documented.

Ambient vibration levels at the Site and at the neighboring NYCT structures should be measured as part of the documentation work. Crack-monitoring gauges should be established at select pre-existing cracks observed at the adjacent structures during the documentation work for future monitoring. In addition, a Professional Land Surveyor licensed in the State of New York should establish elevation and lateral position control points at select locations along the adjacent structures being documented. The subway tunnel, subway entrance, and walkway structure documentation and monitoring requirements should be discussed and confirmed with NYCT.

At a minimum, the neighboring NYCT subway tunnel, subway entrance, and walkway structures should be periodically monitored for movements during the on-site excavation and foundation construction activities using the above-mentioned crack-monitoring gauges and elevation and lateral position control points. The purpose of the monitoring is so the Contractor(s) performing the work can determine if the neighboring structures are at risk of being adversely impacted by their work, and so the Contractor(s) can make any necessary modifications to their means and methods to avoid such adverse impacts. Vibration levels at the neighboring structures should also be continuously monitored during nearby on-site activities using seismograph vibration monitors placed at strategic locations within these structures.

A vibration-level peak-particle-velocity threshold limit of 0.5 inch/second should be established at the NYCT structures in accordance with the NYCT requirements. Limiting peak particle velocity of vibration level for the neighboring buildings should be preliminarily established at 1.0 inch /second for non-landmarked buildings and at 0.5 inch/second for any buildings designated as a landmark or a historic resource. Field conditions during construction may require adjustments to lower threshold levels, if necessary. Limiting vibration levels at any nearby sensitive utilities should be determined after discussions with the utility owners, as necessary. We recommend a preliminary vertical and lateral movement threshold level of 0.25 inch be established at all neighboring structures, including the NYCT structures. Movement thresholds for any adjacent utilities and associated structures should be confirmed with the respective utility owners. Neighboring structure monitoring should be performed per the applicable NYCDOB and NYCT requirements.

CONTRACTOR AND OWNER OBLIGATIONS

The Contractor is responsible for construction quality control, which includes satisfactorily constructing the foundation system and any associated temporary works to achieve the design intent while not adversely impacting or causing loss of support to neighboring structures or utilities. Construction activities that can alter the existing ground conditions, such as soil excavation, excavation support construction, dewatering, and foundation construction, can also potentially induce stresses, vibrations, and movements in nearby structures and utilities, and disturb nearby structure occupants. Contractors working at the site must ensure that their activities will not adversely affect the performance of the structures, occupants, and utilities, and take all necessary measures to protect the existing structures during construction. By using this report, the Owner agrees that Langan will not be held responsible for any potential damage to adjacent structures.

This report's preparation and use is based on the condition that the project construction contract between the Owner and their Contractor(s) will include: 1) Langan being added to the Project Wrap and/or Contractor's General Liability Insurance as an additional insured, and 2) language specifically stating the Foundation Contractor will defend, indemnify, and hold harmless the Owner and Langan against all claims related to disturbance or damage to adjacent structures or properties.

ADDITIONAL SERVICES

We recommend performing the following additional engineering studies / services for the proposed development:

1. Test pits should be carefully excavated along the NYCT subway entrance and walkway structures bordering the site to investigate the conditions, extents, and depths of these structures.

2. Technical specifications should be prepared for the geotechnical aspects of proposed construction. We anticipate these specification sections would include:

   - Sheeting and Bracing
   - Excavation, Filling, and Grading
   - Drilled Caissons
   - Foundation Waterproofing

3. Group uplift and lateral capacity analysis should be performed for the caissons after caisson layout has been finalized.

4. Site-specific temporary support of excavation drawings should be prepared for NYCDOB and NYCT review and approval.

5. Pre-construction existing conditions documentation of the neighboring structures should be performed prior to commencing on-site excavation and construction activities.

6. Temporary excavation support and drilled caisson installation and testing should be inspected by a qualified engineer per the special inspection requirements of the NYCBC.

7. Neighboring structures should be monitored during excavation, temporary excavation support construction, and foundation construction activities using seismographs, crack-monitoring gauges, and elevation and lateral position control points. Monitoring results should be summarized in reports periodically submitted to Ownership. Reports should also be periodically submitted to NYCDOB and NYCT, as necessary.

Langan has investigated and interpreted the site subsurface conditions and has developed the foundation design recommendations contained herein, and is therefore best suited to perform geotechnical special inspection and quality assurance observation and testing during new building foundation construction. Recognizing that construction is essentially the completion of design, Langan's special inspection, and quality assurance observation and testing during foundation construction is necessary to maintain Langan's continuity of responsibility as it relates to the building foundation for this project.

CLOSURE

The conclusions and recommendations presented in this report represent our best engineering judgment as to the appropriate foundation systems for the proposed development based on currently available investigation data and proposed development information. Recommendations given are contingent upon one another and no recommendation should be followed independently of the others. Any changes in the location, elevation, and/or loading of the proposed structure should be brought to our attention and we should be provided with the structural and architectural drawings once they are finalized, so we can review, confirm, or modify (if necessary) the recommendations provided herein. Additional studies / services are recommended as the Project moves forward to address geotechnical issues that may impact the proposed development.

This report has been prepared to assist the Architect and Structural Engineer in their design. The recommendations in this report should be incorporated in the Project design through inclusion in the Project Construction Drawings and foundation-related technical specifications. Our office should be provided with the foundation drawings and details prepared by the Structural Engineer and Architect, so we can confirm our recommendations are properly incorporated in the construction documents. Our office should also review foundation-related contractor submittals and construction procedures related to the geotechnical aspects of construction. Langan cannot assume responsibility for use of this report for any areas beyond the limits of this study or for any projects not specifically discussed herein.

Note that any potential environmental concerns at the site are outside the scope of this geotechnical study. These aspects are being addressed in separate reports and documentation.

SATYAJIT A. VAIDYA
9797-1

Sincerely,
Langan Engineering, Environmental, Surveying,
Landscape Architecture and Geology, D.P.C.

Vaidya

Satyajit A. Vaidya, P.E.
Principal / Vice President

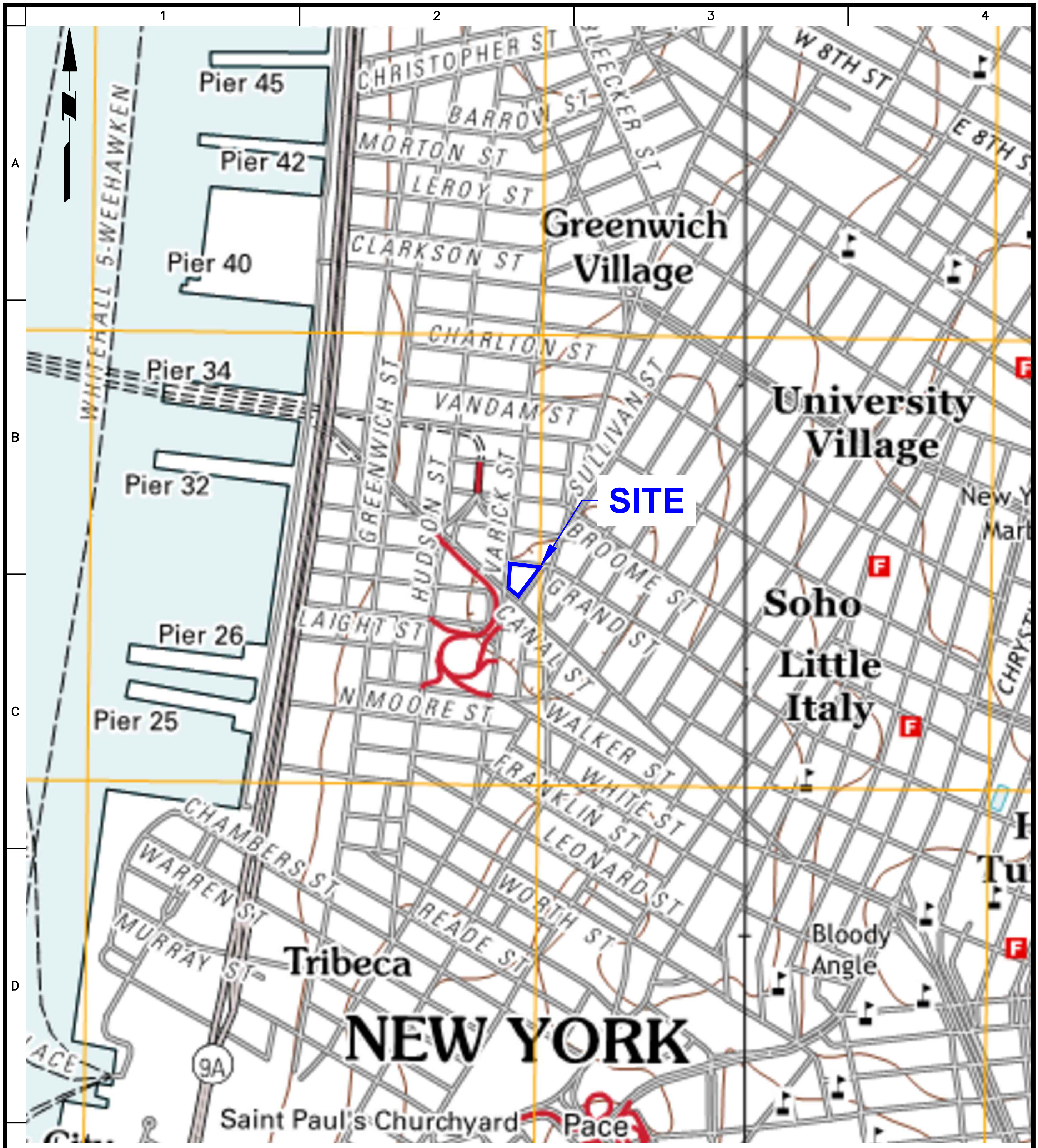
cc: Chris Squeo, Margaux Petersen / Taconic
Jagrat Jariwala, Cristina Robles, Chris McMahon, Steve Ciambruschini / Langan

Attachments: Figures 1 through 8; Attachments A through C

\\langan.com\data\NYC\data0\170470002\Project Data_Discipline\Geotechnical\Reports\Geotechnical Report\2 Hudson Square - Geotechnical Investigation Report (2022-06-08).doc

FIGURES

Figure 1 Site Location Map
Figure 2 Bedrock Map
Figure 3 Viele Map
Figure 4 FEMA Preliminary Flood Map
Figure 5 Subsurface Investigation Location Plan
Figure 6 Boring Profile Drawing 1
Figure 7 Boring Profile Drawing 2
Figure 8 Lateral Pressure Diagram



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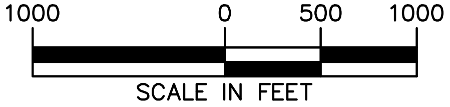
SOURCE: USGS TOPO MAP, "JERSEY CITY QUADRANGLE: NEW JERSEY-NEW YORK 7.5 MINUTE SERIES" DATED 2011.



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Project	PROPOSED 2 HUDSON SQUARE DEVELOPMENT BLOCK No. 227, LOT No. 63 MANHATTAN NEW YORK
Drawing Title	SITE LOCATION MAP
Project No.	170470002
Date	6/8/2022
Drawn By	AC
Checked By	CR
Drawing No.	1

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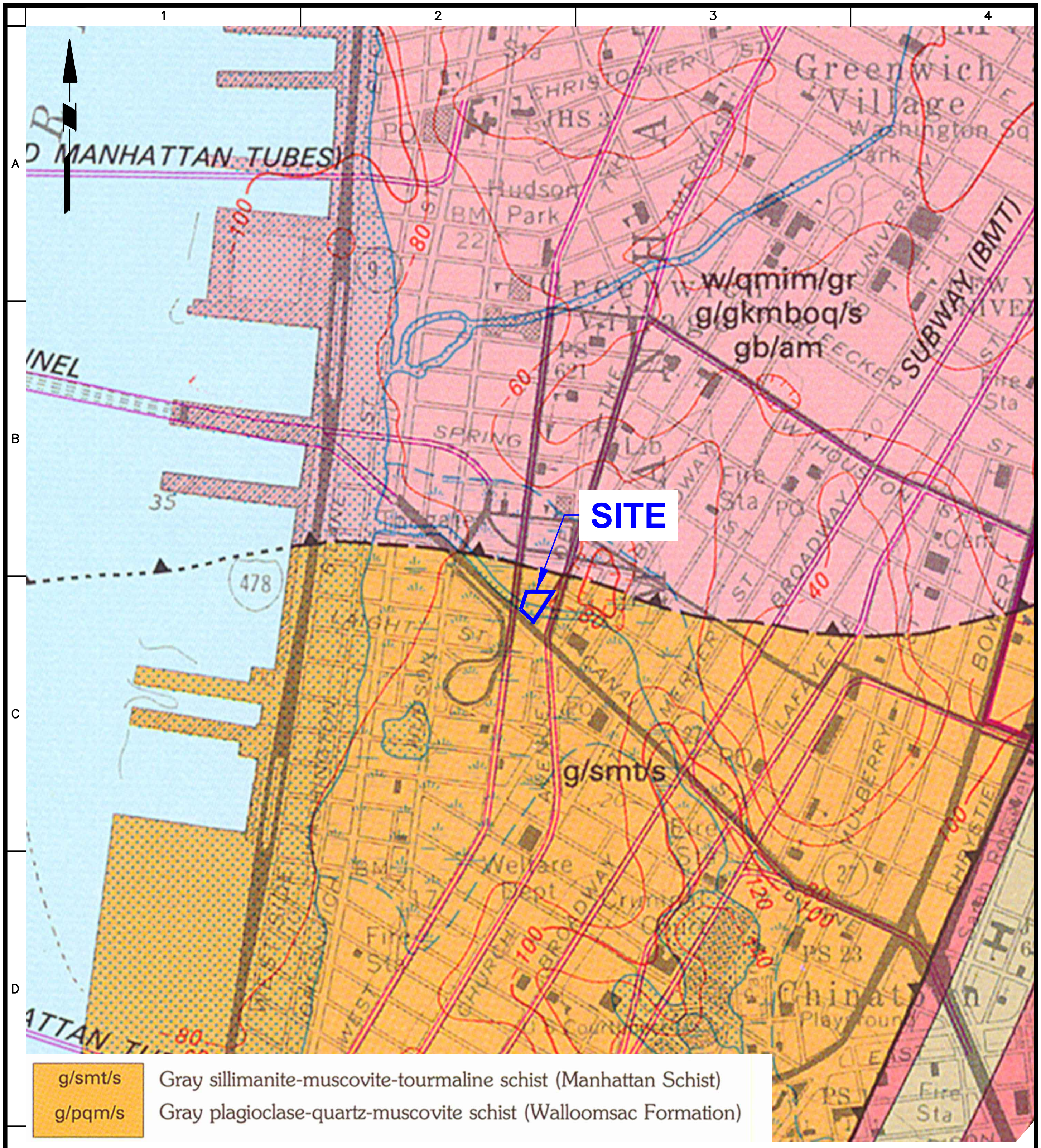
Filename: C:\d0166150\170470002-0201-BI101-0101.dwg Date: 6/8/2022 Time: 17:45 User: crobles Style Table: Langan.stb Layout: Figure 1 - Site Location Plan



g/smt/s	Gray sillimanite-muscovite-tourmaline schist (Manhattan Schist)
g/pqm/s	Gray plagioclase-quartz-muscovite schist (Walloomsac Formation)

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SOURCE: "BEDROCK AND ENGINEERING GEOLOGIC MAPS OF NEW YORK COUNTY AND PARTS OF KINGS AND QUEENS COUNTIES, NEW YORK, AND PARTS OF BERGEN AND HUDSON COUNTIES, NEW JERSEY" BY CHARLES BASKERVILLE, DATED 1994

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BASKERVILLE
BEDROCK MAP

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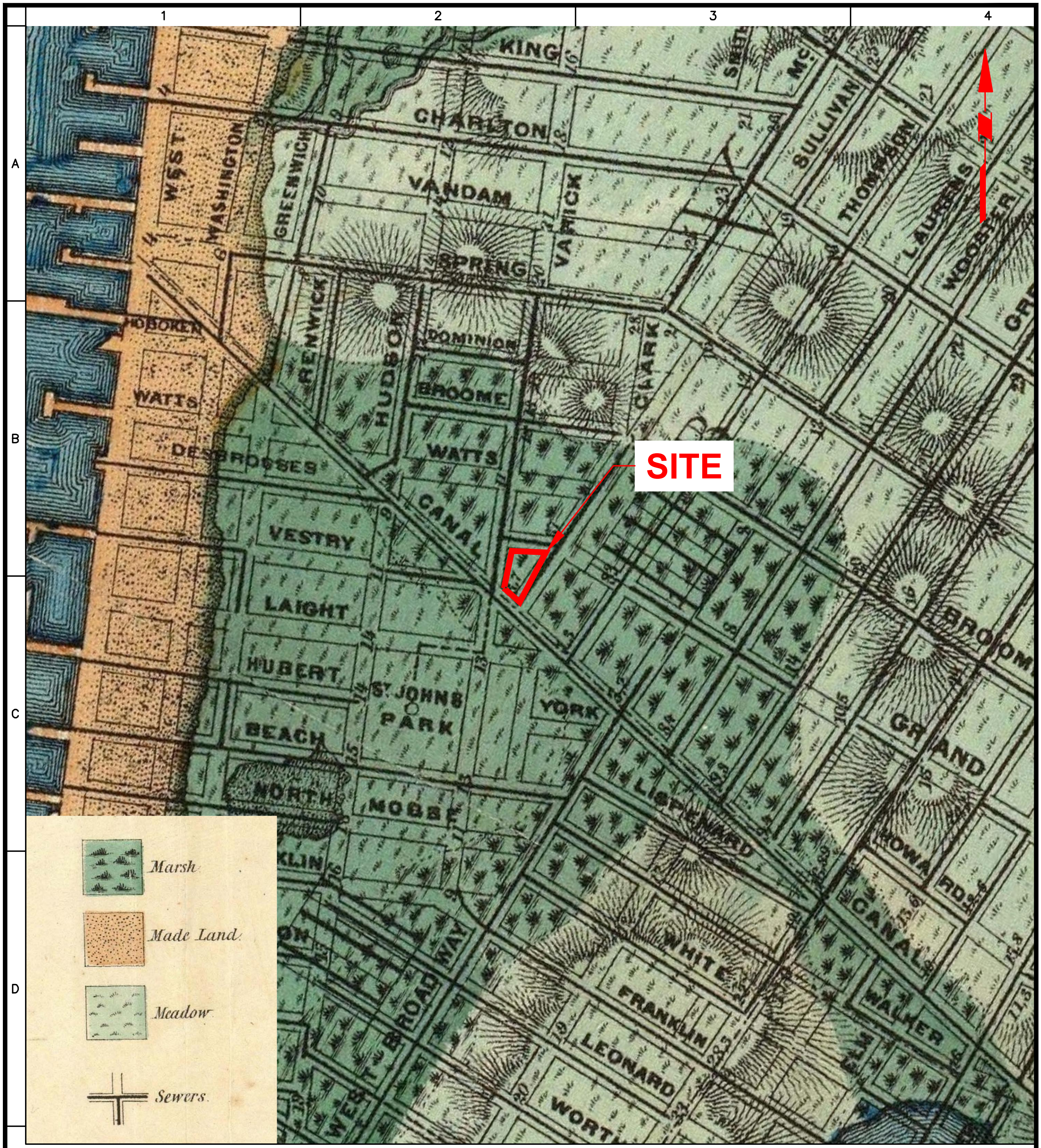

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SOURCE: "SANITARY AND TOPOGRAPHICAL MAP OF THE CITY AND ISLAND OF NEW YORK" BY EGBERY VIELE, DATED 1865.

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MANHATTAN NEW YORK

Drawing Title

HISTORIC VIELE
MAP

Project No.	170470002
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Drawing No.

3

Filename: C:\d0166150\FG03-170470002-0201-BI101-0101.dwg Date: 6/8/2022 Time: 17:48 User: crobles Style Table: Langan.stb Layout: Figure 3

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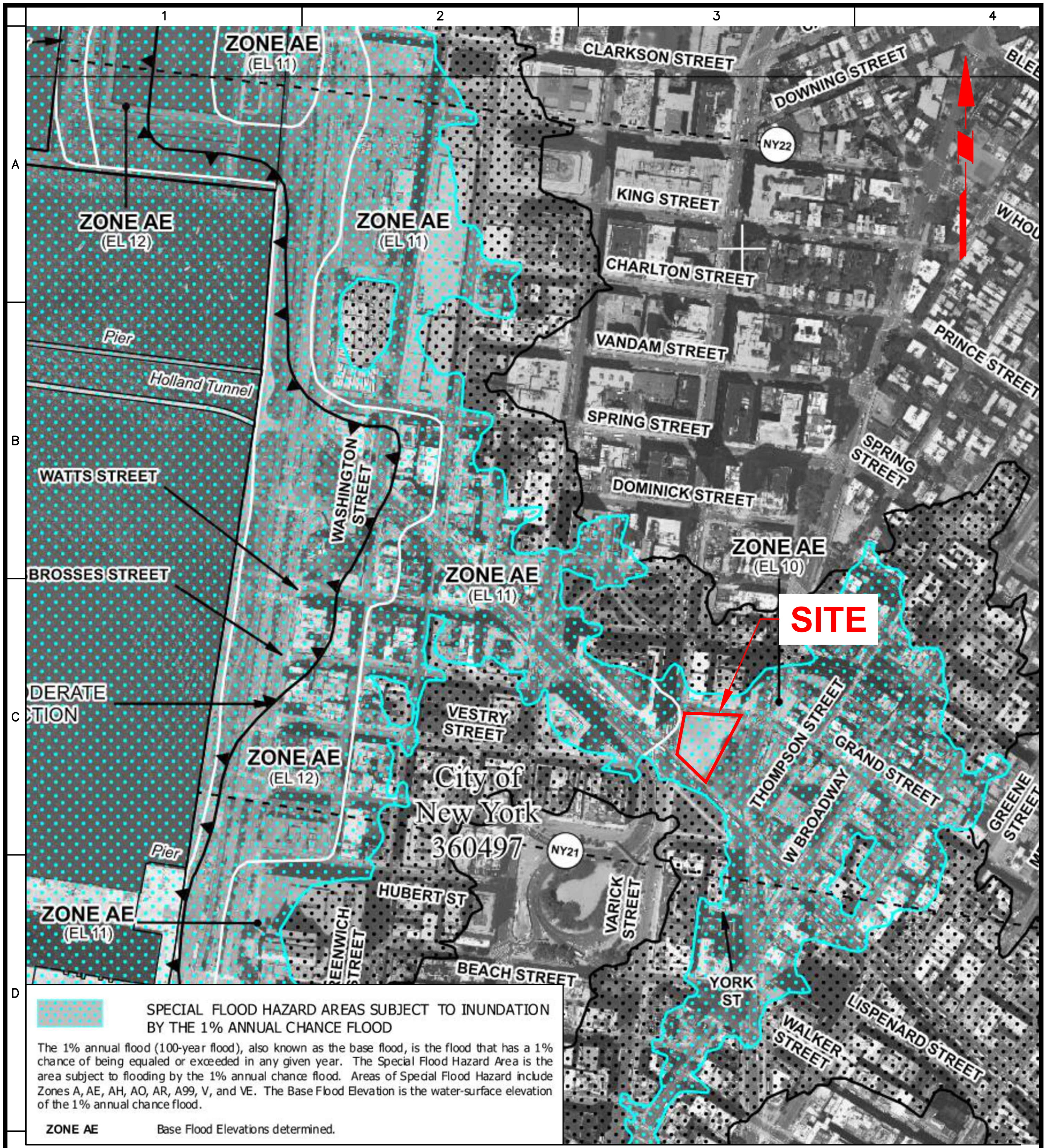

▨ SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE AE	Base Flood Elevations determined.

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SOURCE: "FIRM – FLOOD INSURANCE RATE MAP" PANEL 182 OF 457, MAP NUMBER 3604970182G, PRELIMINARY DECEMBER 5, 2013

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FEMA MAP

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4

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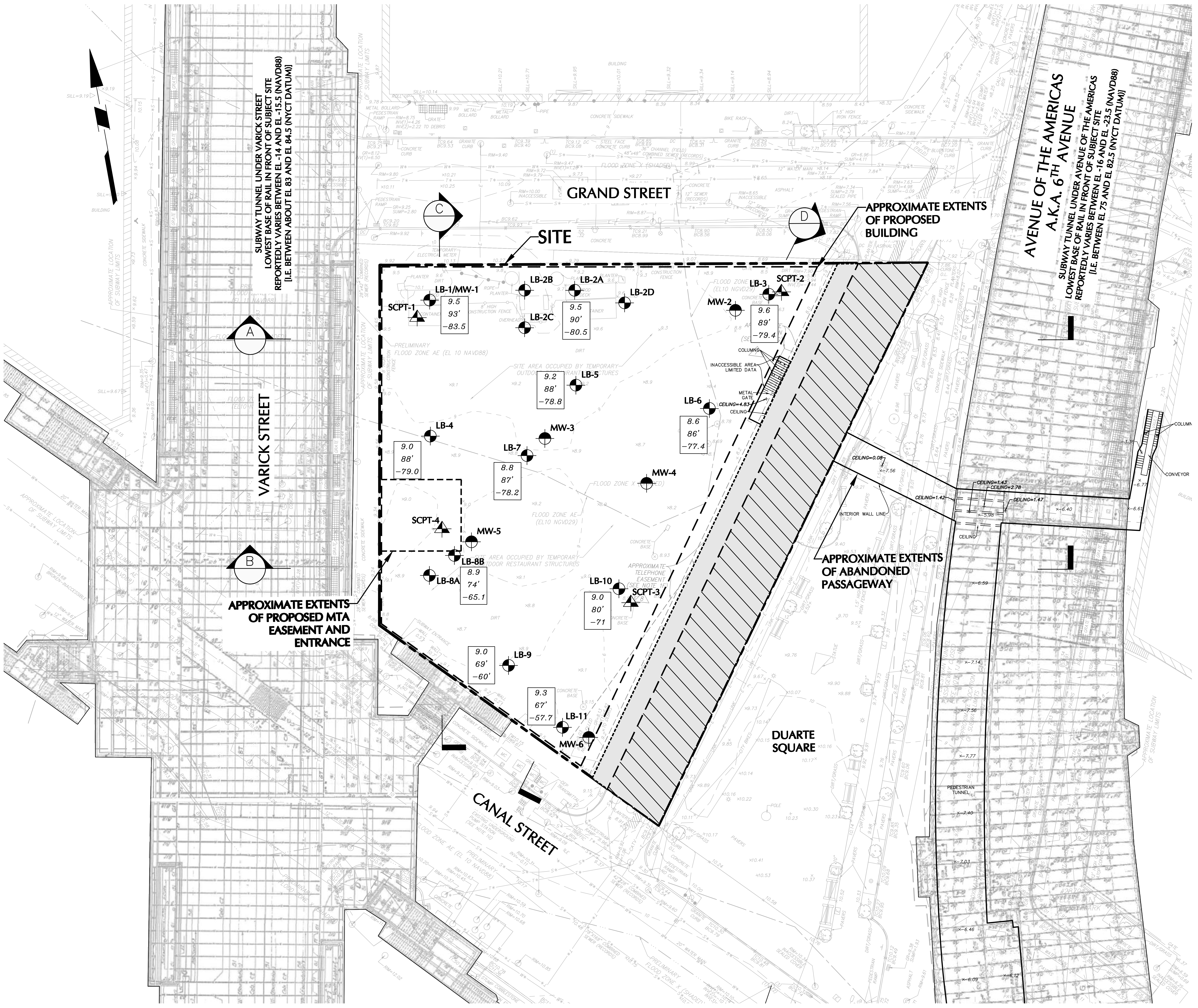
SUBWAY TUNNEL UNDER VARICK STREET
LOWEST BASE OF RAIL IN FRONT OF SUBJECT SITE
REPORTEDLY VARIES BETWEEN EL -14 AND EL -15.5 (NAVD88)
[I.E. BETWEEN ABOUT EL 83 AND EL 84.5 (NYCT DATUM)]
GRAND STREET
VARICK STREET
CANAL STREET
AVENUE OF THE AMERICAS
A.K.A. 6TH AVENUE
SUBWAY TUNNEL UNDER AVENUE OF THE AMERICAS
LOWEST BASE OF RAIL IN FRONT OF SUBJECT SITE
REPORTEDLY VARIES BETWEEN EL -16 AND EL -23.5 (NAVD88)
[I.E. BETWEEN EL 75 AND EL 82.5 (NYCT DATUM)]
SITE
APPROXIMATE EXTENTS OF PROPOSED BUILDING
APPROXIMATE EXTENTS OF PROPOSED MTA EASEMENT AND ENTRANCE
APPROXIMATE EXTENTS OF ABANDONED PASSAGEWAY
DUARTE SQUARE
A
B
C
D
LB-1/MW-1 9.5 93' -83.5
SCPT-1
LB-2B
LB-2A 9.5 90' -80.5
LB-2C
LB-2D
LB-3 9.6 89' -79.4
SCPT-2
MW-2
LB-5 9.2 88' -78.8
LB-6 8.6 86' -77.4
LB-4 9.0 88' -79.0
MW-3
LB-7 8.8 87' -78.2
MW-4
SCPT-4
MW-5
LB-8B
LB-8A 8.9 74' -65.1
LB-10 9.0 80' -71
SCPT-3
LB-9 9.0 69' -60'
LB-11 9.3 67' -57.7
MW-6
APPROXIMATE TELEPHONE EASEMENT (SEE NOTE 5)
INACCESSIBLE AREA LIMITED DATA
COLUMNS
METAL GATE
CEILING=4.83
INTERIOR WALL LINE
PEDESTRIAN TUNNEL
CONVEYOR
PRELIMINARY FLOOD ZONE AE (EL 10 NAVD88)
FLOOD ZONE AE (EL10 NGVD29)

PLAN VIEW

SCALE: 1" = 20'

LEGEND:

LB-1	APPROXIMATE LOCATION AND IDENTIFICATION OF DRILLED BORING
MW-1	APPROXIMATE LOCATION AND IDENTIFICATION OF GROUNDWATER LEVEL OBSERVATION WELL
SCPT-1	APPROXIMATE LOCATION AND IDENTIFICATION OF SEISMIC CONE PENETRATION TEST PROBE BORING
▬ ▬	PROPERTY LINE
9.5	GROUND ELEVATION AT BORING
93'	DEPTH TO ROCK
-83.5	TOP OF ROCK ELEVATION (NAVD88)
▨	APPROXIMATE EXTENTS OF DEP EASEMENT
▧	APPROXIMATE EXTENTS OF DEMAPPED SULLIVAN STREET

GENERAL NOTES:

1. BASE FIGURE IS REPRODUCED FROM A 22 MAY 2017 (REVISED 13 JULY 2020) SURVEY PREPARED BY LANGAN.
2. ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), WHICH IS 1.1 FEET ABOVE THE NATIONAL GEODETIC SURVEY DATUM OF 1929 (NGVD29; MEAN SEA LEVEL AT SANDY HOOK, NJ).
3. REFERENCES FOR ELEVATIONS, LIMITS, AND SECTIONS OF TA STRUCTURE ON 6TH AVENUE ARE THE FOLLOWING TITLED: "STRUCTURAL PLANS FOR ROUTE NO. 101 – SECTION NO.3":
   - DRAWING NO. 302, DATED 7 FEBRUARY 1927
   - DRAWING NO.332, DATED 10 MARCH 1927.
   - DRAWING NO.357, DATED 11 MAY 1927.
   - DRAWING NO.358, DATED MAY 1927.
   - DRAWING NO. UNREADABLE, SECTION A–A DATED MAY 1927.
4. REFERENCES FOR ELEVATIONS, LIMITS, AND SECTIONS OF TA STRUCTURE ON VARICK STREET ARE THE FOLLOWING TITLED: "STRUCTURAL PLANS FOR ROUTE NO. 4 & 38 – SECTION NO.3":
   - CONTRACT DRAWING NO. C–2 DATED JULY 1913.
   - DRAWING NO. 25, DATED 8 APRIL 1914.
   - DRAWING NO.60 DATED 10 JULY 1915.
   - UNREADABLE DRAWING, DATED 11 MARCH 1915.
5. PEDESTRIAN TUNNEL LOCATION AND EXTENTS ASSOCIATED WITH THE NYCT TUNNEL STRUCTURE ALONG THE AVENUE OF THE AMERICAS ARE REFERENCED FROM A 25 JUNE 2019 DRAWING PREPARED BY LANGAN.
6. ALL BORING AND SCPT PROBE LOCATIONS ARE APPROXIMATE.
7. BORINGS LB–1 THROUGH LB–11 WERE DRILLED BY CRAIG TEST BORING COMPANY, INC. BETWEEN 15 JUNE 2017 AND 6 JULY 2017. THE SEISMIC CONE PENETRATION TEST PROBE BORINGS SCPT–1 THROUGH SCPT–4 WERE PERFORMED BY CONETEC, INC. BETWEEN 17 AND 18 OCTOBER 2017. THE GROUNDWATER LEVEL OBSERVATION WELLS WERE INSTALLED BY AARCO BETWEEN 8 AND 12 JUNE 2017. ALL BORINGS AND SCPTs WERE PERFORMED UNDER THE FULL–TIME OBSERVATION OF A LANGAN FIELD ENGINEER.

20 0 5 10 20
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Drawing Title
SUBSURFACE INVESTIGATION LOCATION PLAN

Project No. 170470002	Drawing No. 5
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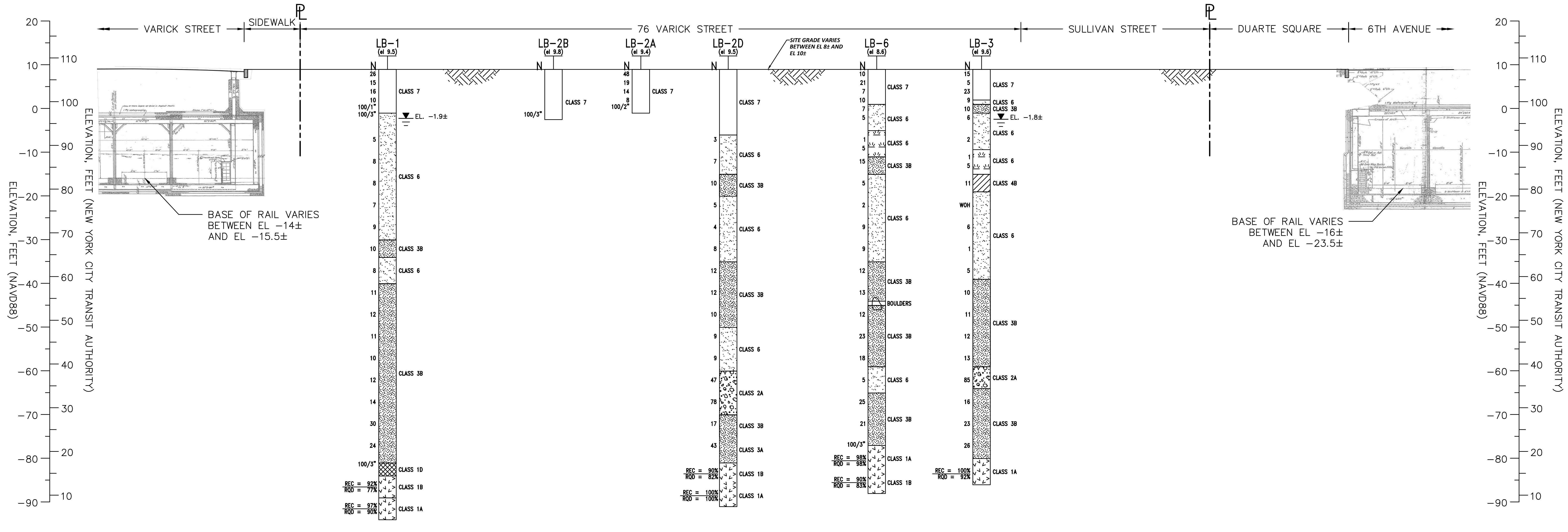
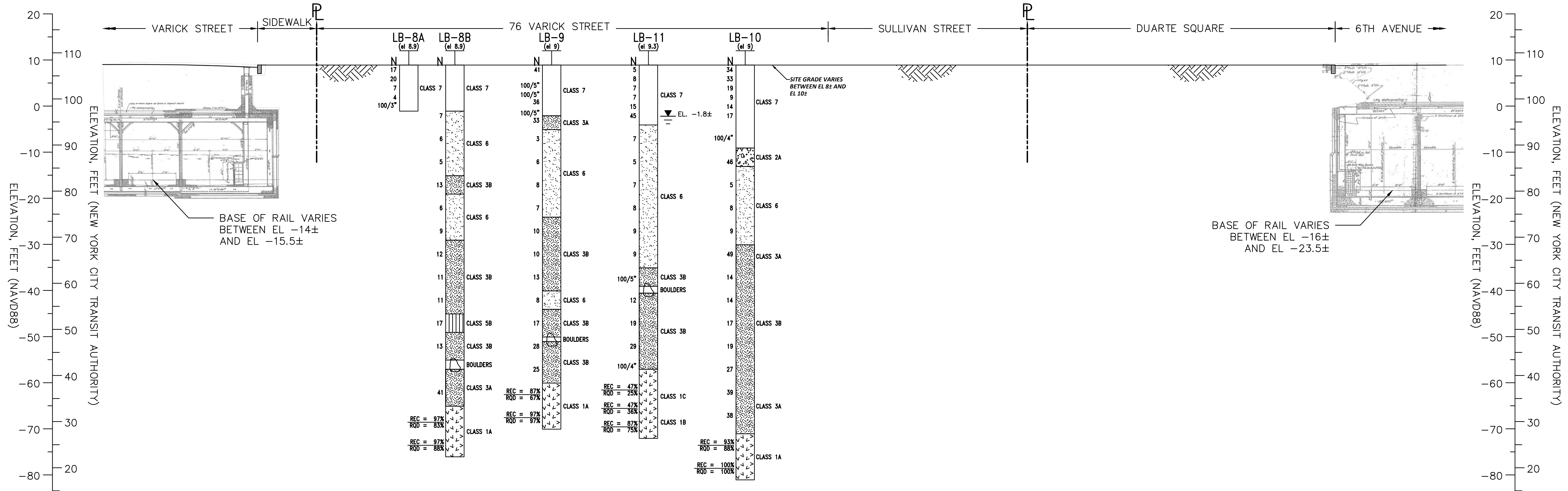


SECTION A-A

FACING NORTH

VERTICAL SCALE: 1" = 10'


VARICK STREET
SIDEWALK
76 VARICK STREET
SULLIVAN STREET
DUARTE SQUARE
6TH AVENUE
LB-8A (el 8.9)
LB-8B (el 8.8)
LB-9 (el 9)
LB-11 (el 9.3)
LB-10 (el 9)
SITE GRADE VARIES BETWEEN EL 8± AND EL 10±
EL. −1.8±
BOULDERS
BASE OF RAIL VARIES BETWEEN EL −14± AND EL −15.5±
BASE OF RAIL VARIES BETWEEN EL −16± AND EL −23.5±
ELEVATION, FEET (NEW YORK CITY TRANSIT AUTHORITY)
ELEVATION, FEET (NAVD88)

SECTION B-B

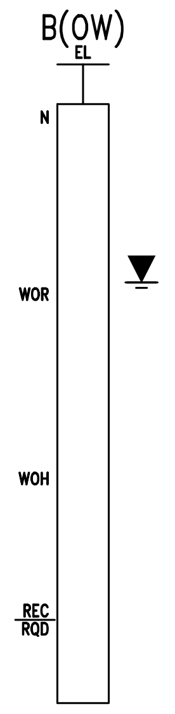
FACING NORTH

VERTICAL SCALE: 1" = 15'

NOTES:

1. SEE DRAWING NO. 4 FOR GENERAL NOTES.
2. THIS PROFILE SHOWS GENERALIZED SUBSURFACE SOIL CONDITIONS ENCOUNTERED AT WIDELY SPACED BORINGS. SOIL, GROUNDWATER, AND ROCK CONDITIONS MAY VARY IN TYPE, LOCATION, ELEVATION, AND ENVIRONMENTAL AND ENGINEERING PROPERTIES BETWEEN THESE BORINGS. VARIATIONS IN SUBSURFACE CONDITIONS SHOULD BE EXPECTED BETWEEN BORINGS.

BORING KEY:



B	BORING IDENTIFICATION
EL	GROUND SURFACE ELEVATION AT TIME OF BORING
N	STANDARD PENETRATION RESISTANCE; NUMBER OF BLOWS OF A 140LB HAMMER, FREE FALLING 30" TO DRIVE A 2" O.D. SPLIT SPOON SAMPLER 12" AFTER 6" OF INITIAL PENETRATION
REC	(LENGTH OF ROCK RETRIEVED)/(LENGTH OF ROCK CORED) x 100%
RQD	ROCK QUALITY DESIGNATION; (LENGTH OF ROCK PIECES 4" OR LONGER)/(LENGTH OF ROCK CORED) X 100%
OW	GROUNDWATER OBSERVATION WELL
▼	MEASURED STATIC GROUNDWATER LEVEL
WOR	2-FOOT PENETRATION OF THE SPLIT SPOON SAMPLER UNDER THE OWN WEIGHT OF RODS
WOH	2-FOOT PENETRATION OF THE SPLIT SPOON SAMPLER UNDER THE STATIC WEIGHT OF THE DRIVING HAMER

BUILDING CODE CLASSIFICATIONS:

CLASS 1	BEDROCK
CLASS 1A	HARD SOUND ROCK – gneiss, diabase, schist
CLASS 1B	MEDIUM HARD ROCK – marble,serpentine
CLASS 1C	INTERMEDIATE ROCK – shale, sandstone
CLASS 1D	SOFT ROCK – weathered rock
CLASS 2	SANDY GRAVEL AND GRAVEL (GW, GP)
CLASS 2A	DENSE SANDY GRAVEL AND GRAVEL
CLASS 2B	MEDIUM SANDY GRAVEL ADN GRAVEL
CLASS 3	GRANULAR SOILS (GC, GM, SW, SP, SM, and SC)
CLASS 3A	DENSE GRANULAR SOILS
CLASS 3B	MEDIUM GRANULAR SOILS
CLASS 4	CLAYS (SC, CL, and CH)
CLASS 4A	HARD CLAYS
CLASS 4B	STIFF CLAYS
CLASS 4C	MEDIUM CLAYS
CLASS 5	SILTS AND SILTY SOILS (ML AND MH)
CLASS 5A	DENSE SILTS AND SILTY SOILS
CLASS 5B	MEDIUM SILTS AND SILTY SOILS
CLASS 6	Organic SIlts, Organic Clays, Peats, Soft Clays, Loose Granular Soils and Varved Silts
CLASS 7	Controlled and Uncontrolled Fills

MATERIAL HATCHES:

☐	FILL	░	LOOSE SAND (CLASS 6)
▒	SAND (CLASS 3A/3B)	⁂	PEAT
▨	CLAY	⁘	GRAVEL
▥	SILT	▩	WEATHERED ROCK
⋰	BEDROCK		

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NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project

PROPOSED 2 HUDSON SQUARE DEVELOPMENT

BLOCK No. 227, LOT No. 63

MANHATTAN NEW YORK

Drawing Title

BORING PROFILE DRAWING 1

Project No. 170470002	Drawing No. 6
Date 6/8/2022	
Drawn By AC	
Checked By CR	

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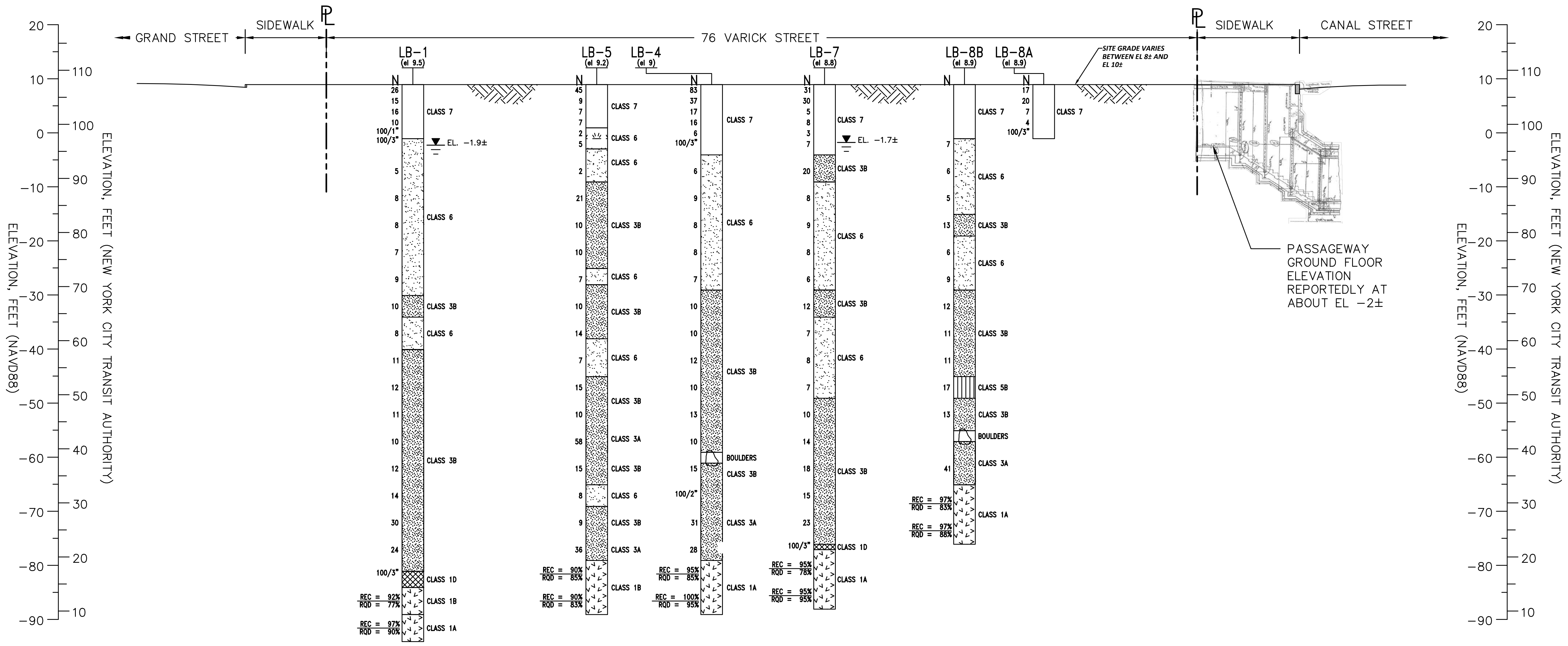
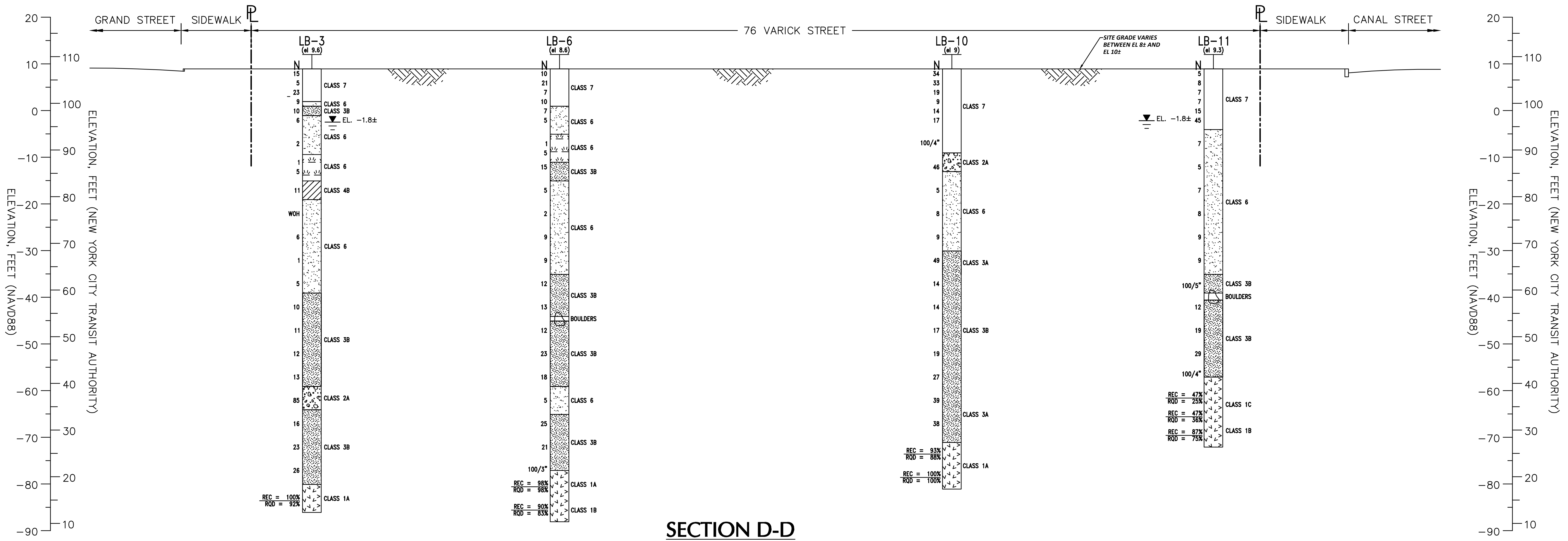


SECTION C-C

FACING EAST
VERTICAL SCALE: 1" = 15'



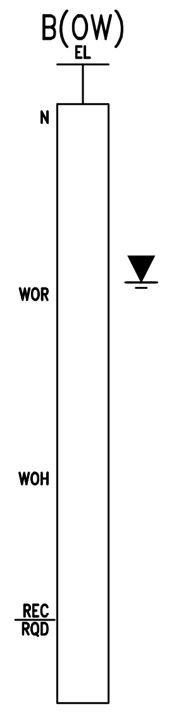
SECTION D-D

FACING EAST
VERTICAL SCALE: 1" = 15'

NOTES:

1. SEE DRAWING NO. 4 FOR GENERAL NOTES.
2. THIS PROFILE SHOWS GENERALIZED SUBSURFACE SOIL CONDITIONS ENCOUNTERED AT WIDELY SPACED BORINGS. SOIL, GROUNDWATER, AND ROCK CONDITIONS MAY VARY IN TYPE, LOCATION, ELEVATION, AND ENVIRONMENTAL AND ENGINEERING PROPERTIES BETWEEN THESE BORINGS. VARIATIONS IN SUBSURFACE CONDITIONS SHOULD BE EXPECTED BETWEEN BORINGS.

BORING KEY:



B	BORING IDENTIFICATION
EL	GROUND SURFACE ELEVATION AT TIME OF BORING
N	STANDARD PENETRATION RESISTANCE; NUMBER OF BLOWS OF A 140LB HAMMER, FREE FALLING 30" TO DRIVE A 2" O.D. SPLIT SPOON SAMPLER 12" AFTER 6" OF INITIAL PENETRATION
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CLASS 2A	DENSE SANDY GRAVEL AND GRAVEL
CLASS 2B	MEDIUM SANDY GRAVEL ADN GRAVEL
CLASS 3	GRANULAR SOILS (GC, GM, SW, SP, SM, and SC)
CLASS 3A	DENSE GRANULAR SOILS
CLASS 3B	MEDIUM GRANULAR SOILS
CLASS 4	CLAYS (SC, CL, and CH)
CLASS 4A	HARD CLAYS
CLASS 4B	STIFF CLAYS
CLASS 4C	MEDIUM CLAYS
CLASS 5	SILTS AND SILTY SOILS (ML AND MH)
CLASS 5A	DENSE SILTS AND SILTY SOILS
CLASS 5B	MEDIUM SILTS AND SILTY SOILS
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CLASS 7	Controlled and Uncontrolled Fills

MATERIAL HATCHES:

☐	FILL	▒	LOOSE SAND (CLASS 6)
▓	SAND (CLASS 3A/3B)	▤	PEAT
▨	CLAY	▩	GRAVEL
▥	SILT	▦	WEATHERED ROCK
▧	BEDROCK		

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Project

PROPOSED
2 HUDSON SQUARE
DEVELOPMENT
BLOCK No. 227, LOT No. 63
MANHATTAN NEW YORK

Drawing Title

BORING PROFILE
DRAWING 2

Project No. 170470002	Drawing No. 7
Date 6/8/2022	
Drawn By AC	
Checked By CR	

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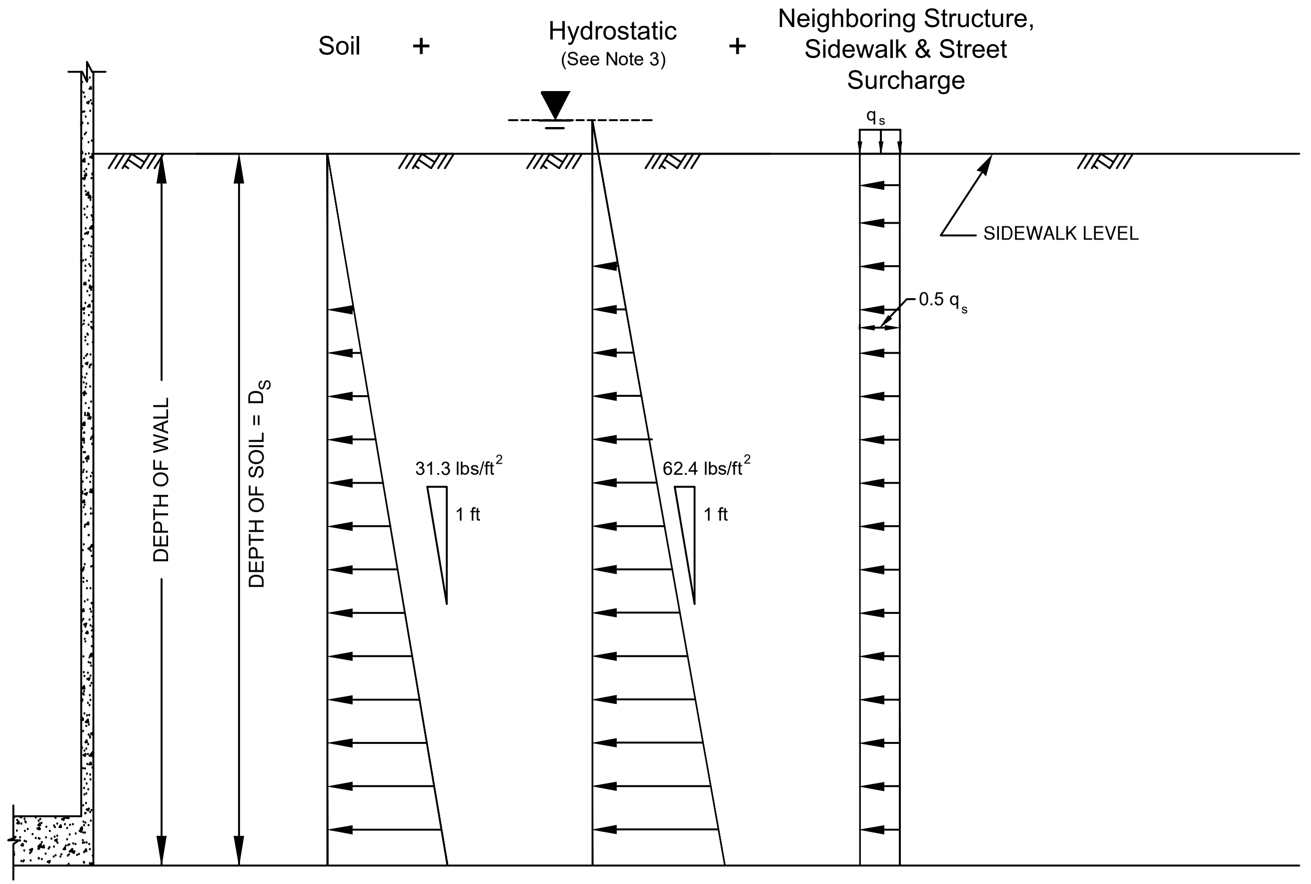

NOTES:

1. Diagrams shown are a simplified representation of various lateral loads for use in design of the perimeter below-grade foundation walls.

2. Lateral pressure diagram for soil is based on a soil total unit weight of 125 pcf; and on lateral earth pressure coefficient (K_o) of 0.5.

3. The base flood elevation for the site, corresponding to the 1% annual chance flood elevation indicated on the FEMA Preliminary Flood Insurance Rate Map (preliminary as of 5 December 2013), is determined to be el 10 (NAVD88). Groundwater level at the site was observed to be several feet below this level. Therefore, the flood level will govern the foundation design. The design flood elevation should be at or above el 12 (NAVD88), that is at least 2 feet above the base flood elevation per NYC Local Law 43.

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Project
PROPOSED
2 HUDSON SQUARE
DEVELOPMENT
BLOCK No. 227, LOT No. 63
MANHATTAN NEW YORK

Drawing Title
LATERAL PRESSURE
DIAGRAM

Project No.
170470002
Date
6/8/2022
Drawn By
AC
Checked By
CR

Drawing No.
8

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ATTACHMENT A

2017 Drilled Boring Logs

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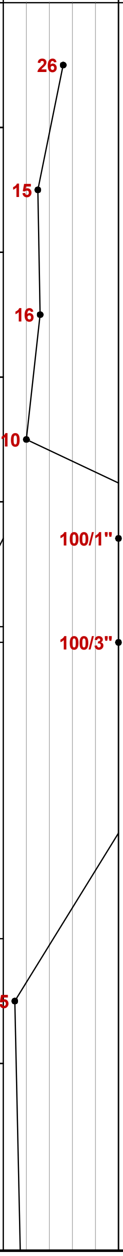
Log of Boring **LB-1** Sheet 1 of 5

Project	76 Varick Street (2 Hudson Square)	Project No.	170470001
Location	New York, New York	Elevation and Datum	El. 9.5± (NAVD 88) NAVD 88
Drilling Company	Craig Test Boring, Inc.	Date Started	6/20/17
		Date Finished	6/21/17
Drilling Equipment	Truck Rig	Completion Depth	103 ft
		Rock Depth	93 ft
Size and Type of Bit	2 7/8" Tricone Roller Bit	Number of Samples	Disturbed 22 Undisturbed - Core 2
Casing Diameter (in)	4" Stainless Steel	Casing Depth (ft)	49
Water Level (ft.)	First ∇ -	Completion ▼ -	24 HR. ∇ 11.2
Casing Hammer	Automatic	Weight (lbs) 140	Drop (in) 30
Sampler	2" Split Spoon	Drilling Foreman	Dave Cooke
Sampler Hammer	Automatic	Weight (lbs) 140	Drop (in) 30
Field Engineer	Taylor Adams		

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+9.5	Reddish Brown coarse to fine SAND, some Brick (Dry) [Class 7]		0	S-1	SS	12	2 12 14 18	26	-Drilling starts at 10:45AM 6/20/17 -Took S-1 at 0'-2'
	Reddish Brown coarse to fine SAND, some Brick (Dry) [Class 7]		2	S-2	SS	10	5 8 7 9	15	-Took S-2 at 2'-4'
	Reddish Brown coarse to fine SAND, some Gravel, some Brick (Moist) [Class 7]		4	S-3	SS	10	4 8 8 7	16	-Hammer casing to 4' -Drill to 4' -Took S-3 at 4'-6'
	Reddish Brown coarse to fine SAND, some Gravel, some Brick (Moist) [Class 7]		6	S-4	SS	8	8 5 5 7	10	-Took S-4 at 6'-8'
	No Recovery		8	S-5	SS	0	7 100/1"	100/1"	-Hammer casing to 8' -Cleared to 8' -Took S-5 at 8'-10'
-0.5	No Recovery	∇	10	S-6	SS	0	100/3"	100/3"	-Cleared to 10' and added water -Took S-6 at 10'-12' -Drill to 15' Drilling: Very rough at 14' Wash: Brown -Hammer casing to 14' -Cleared to 15'
	Brown coarse to fine SAND, trace Silt (Wet) [Class 6]		15	S-7	SS	12	2 3 2 3	5	-Took S-7 at 15'-17' -Drill to 20' Drilling: Smooth Wash: Brown
			20						



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Log of Boring **LB-1** Sheet 2 of 5

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9.5± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-10.5			20						
	Reddish Brown medium to fine SAND, trace Silt (Wet) [Class 6]		20-22	S-8	SS	10	3 4 4 4	8	-Took S-8 at 20'-22'
			22-25						-Drill to 25' Drilling: Smooth Wash: Brown
	Reddish Brown fine SAND, some Silt (Wet) [Class 6]		25-27	S-9	SS	16	2 4 4 3	8	-Took S-9 at 25'-27'
			27-30						-Drill to 30' Drilling: Smooth Wash: Reddish Brown
	Reddish Brown fine SAND, some Silt (Wet) [Class 6]		30-32	S-10	SS	12	3 3 4 4	7	-Took S-10 at 30'-32'
			32-35						-Drill to 35' Drilling: Smooth Wash: Reddish Brown
	Reddish Brown fine SAND, some Silt (Wet) [Class 6]		35-37	S-11	SS	18	4 4 5 5	9	-Took S-11 at 35'-37'
			37-40						-Drill to 40' Drilling: Smooth Wash: Reddish Brown
-29.5			39						
	Reddish Brown fine SAND, some Silt (Wet) [Class 3B]		40-42	S-12	SS	16	4 5 5 8	10	-Took S-12 at 40'-42'
-33.5			43						-Drill to 45' Drilling: Smooth Wash: Reddish Brown
			45						

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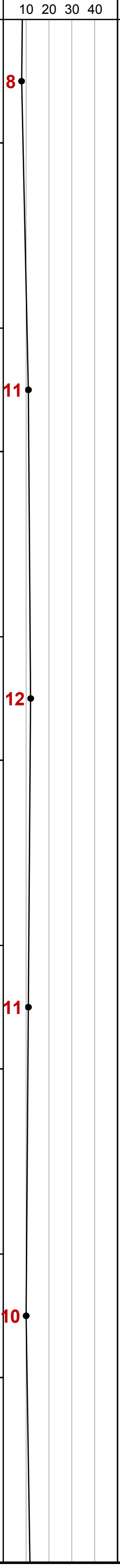
Log of Boring **LB-1** Sheet 3 of 5

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9.5± (NAVD 88) NAVD 88

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	-35.5	Reddish Brown fine Silty SAND (Wet) [Class 6]		45 46 47	S-13	SS	12	3 4 4 4	8	-Took S-13 at 45'-47'
				48 49						-Drill to 50' Drilling: Smooth Wash: Reddish Brown
	-39.5			50						
		Reddish Brown fine Silty SAND (Wet) [Class 3B]		51 52	S-14	SS	16	4 5 6 8	11	-Took S-14 at 50'-52'
				53 54 55						-Push casing to 49' -Drill to 55' Drilling: Smooth Wash: Reddish Brown
		Reddish Brown fine Silty SAND (Wet) [Class 3B]		56 57	S-15	SS	20	4 6 6 7	12	-Took S-15 at 55'-57'
				58 59 60						-Drill to 60' Drilling: Smooth Wash: Reddish Brown
		Reddish Brown fine Silty SAND (Wet) [Class 3B]		61 62	S-16	SS	18	4 5 6 8	11	-Took S-16 at 60'-62'
				63 64 65						-Drill to 65' Drilling: Smooth Wash: Reddish Brown
		Reddish Brown fine Silty SAND (Wet) [Class 3B]		66 67	S-17	SS	16	5 5 5 5	10	-Took S-17 at 65'-67'
				68 69 70						-Drill to 70' Drilling: Smooth Wash: Reddish Brown



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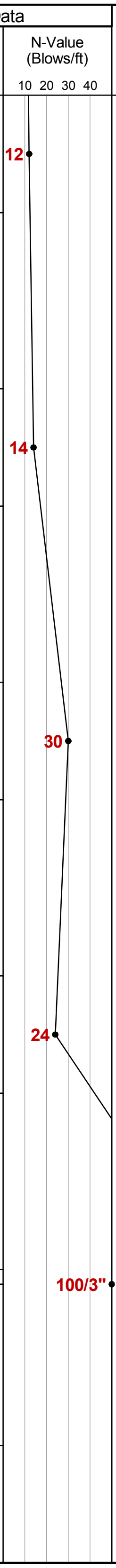
Log of Boring **LB-1** Sheet 4 of 5

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9.5± (NAVD 88) NAVD 88



Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-60.5			70						
	Reddish Brown medium to fine SAND, some Silt (Wet) [Class 3B]		70–72	S-18	SS	16	4 6 6 8	12	-Took S-18 at 70'-72'
			72–75						-Drill to 75' Drilling: Smooth Wash: Reddish Brown
	Reddish Brown medium to fine SAND, some Silt (Wet) [Class 3B]		75–77	S-19	SS	20	5 6 8 9	14	-Took S-19 at 75'-77'
			77–80						-Drill to 80' Drilling: Smooth Wash: Reddish Brown
	Reddish Brown medium to fine SAND, some Silt (Wet) [Class 3B]		80–82	S-20	SS	16	11 15 15 13	30	-Took S-20 at 80'-82'
			82–85						-Drill to 85' Drilling: Smooth Wash: Reddish Brown
	Reddish Brown medium to fine SAND, some Silt (Wet) [Class 3B]		85–87	S-21	SS	20	9 13 11 11	24	-Took S-21 at 85'-87'
			87–90						-Drill to 90' Drilling: Smooth Wash: Reddish Brown
-80.5	Brown WEATHERED ROCK (Wet) [Class 1D]		90	S-22	SS	0	100/3"	100/3"	-Took S-22 at 90'-92'
-83.5		8:00	93–94	C-1	NX CORE				-Drill to 93' Drilling: Rig Chatter/Slow Wash: Dark Brown
		4:00	94–95						

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Log of Boring **LB-1** Sheet 5 of 5

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9.5± (NAVD 88) NAVD 88

MATERIAL SYMBOL	Elev. (ft) -85.5	Sample Description	Coring (min)	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	-88.5	(GOOD) 93' - 98' Grey and Black SCHIST, coarse to fine Mica, Quartz, Feldspar, highly weathered at 93', slightly weathered to fresh at 93' - 98', moderate to close fractures, shallow to moderate dipping, strong [Class 1B]	6:00 5:00 5:00	95 96 97 98	C-1	NX CORE	REC=55"/60" =92%	RQD=46"/60" =77%		-Core C-1 at 93'-98'
	-93.5	(GOOD) 98' - 103' Grey and Black SCHIST, coarse Quartz, coarse to fine Mica, Feldspar, slightly weathered to fresh, close to moderate fractures, near vertical dipping at 99', otherwise shallow to moderate dipping, strong [Class 1A]	5:00 4:00 7:00 6:00	99 100 101 102 103	C-2	NX CORE	REC=58"/60" =97%	RQD=54"/60" =90%		-Core C-2 at 98'-103'
				104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120						-E.O.B. at 103' 10:15AM 6/21/17 Installed environmental monitoring well, see environmental well MW-1

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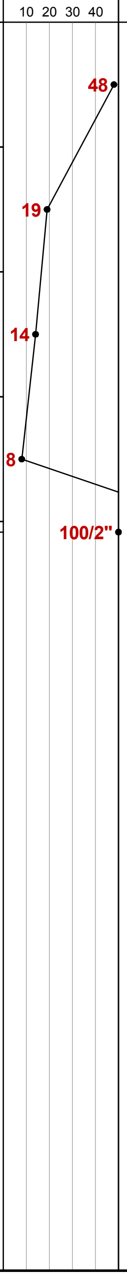
Log of Boring **LB-2A** Sheet 1 of 1

Project 76 Varick Street (2 Hudson Square)		Project No. 170470001	
Location New York, New York		Elevation and Datum El. 9.4± (NAVD 88) NAVD 88	
Drilling Company Craig Test Boring, Inc.		Date Started 7/5/17	Date Finished 7/6/17
Drilling Equipment Truck Rig		Completion Depth 10 ft	Rock Depth -
Size and Type of Bit 2 7/8" Tricone Roller Bit		Number of Samples	Disturbed 5 Undisturbed - Core 0
Casing Diameter (in) 4" Stainless Steel	Casing Depth (ft) 8	Water Level (ft.)	First ▽ - Completion ▼ - 24 HR. ▼ -
Casing Hammer Automatic	Weight (lbs) 140 Drop (in) 30	Drilling Foreman Dave Cooke	
Sampler 2" Split Spoon		Field Engineer Taylor Adams	
Sampler Hammer Automatic	Weight (lbs) 140 Drop (in) 30		

MATERIAL SYMBOL	Elev. (ft) +9.4	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Brown to Red coarse to fine SAND, some Brick, some Gravel (Dry) [Class 7]	0 - 2	S-1	SS	24	11 22 26 27	48	-Drilling starts at 7/5/17 -Took S-1 at 0'-2'
		Brown to Red coarse to fine SAND, some Brick (Dry) [Class 7]	2 - 4	S-2	SS	8	20 10 9 8	19	-Took S-2 at 2'-4' -Hammer casing to 4' -Cleared to 4'
		No Recovery	4 - 6	S-3	SS	0	3 4 10 8	14	-Took S-3 at 4'-6'
		No Recovery	6 - 8	S-4	SS	0	9 5 3 3	8	-Took S-4 at 6'-8'
		Grey CONCRETE FRAGMENTS (Dry) [Class 7]	8 - 10	S-5	SS	2	100/2"	100/2"	-Hammer casing to 8' -Drill to 8' -Took S-5 at 8'-10' -Obstruction -Drill to 10' Drilling: Heavy rig chatter, broke tricone bit and 10' drill rod -Move hole to LB-2B, see log and plan
	-0.6		10						

Depth Scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20



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Log of Boring **LB-2B** Sheet 1 of 1

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9.8± (NAVD 88) NAVD 88
Drilling Company Craig Test Boring, Inc.	Date Started 7/5/17 / Date Finished 7/6/17
Drilling Equipment Truck Rig	Completion Depth 15 ft / Rock Depth -
Size and Type of Bit 2 7/8" Tricone Roller Bit	Number of Samples: Disturbed 1 / Undisturbed - / Core 0
Casing Diameter (in) 4" Stainless Steel / Casing Depth (ft) 14	Water Level (ft.): First ∇ - / Completion ▼ - / 24 HR. ∇ -
Casing Hammer Automatic / Weight (lbs) 140 / Drop (in) 30	Drilling Foreman Dave Cooke
Sampler 2" Split Spoon	Field Engineer Taylor Adams
Sampler Hammer Automatic / Weight (lbs) 140 / Drop (in) 30	

MATERIAL SYMBOL	Elev. (ft) +9.8	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
			0						-See LB-2A for plan
			2						-Hole started at 10'
			5						-Drill to 5'
			6						-Hammer casing to 8'
			8						-Drill to 10'
			10	S-6	SS	0	100/3"	100/3"	
		No Recovery	11						-Took S-6 at 10'-12'
			13						-Drill to 15' Drilling: Rough Wash: Brown
			14						-Hammer casing to 14'
	-5.2		15						-Refusal, move to LB-2C, leave 10' casing in ground
			20						

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Log of Boring **LB-2C** Sheet 1 of 1

Project 76 Varick Street (2 Hudson Square)			Project No. 170470001		
Location New York, New York			Elevation and Datum El. 9.8± (NAVD 88) NAVD 88		
Drilling Company Craig Test Boring, Inc.			Date Started 7/5/17	Date Finished 7/6/17	
Drilling Equipment Truck Rig			Completion Depth 15 ft	Rock Depth -	
Size and Type of Bit 2 7/8" Tricone Roller Bit			Number of Samples	Disturbed 0	Undisturbed -
Casing Diameter (in) 4" Stainless Steel	Casing Depth (ft) 15		Water Level (ft.)	First ▽ -	Completion ▼ -
Casing Hammer Automatic	Weight (lbs) 140	Drop (in) 30	Drilling Foreman Dave Cooke		
Sampler 2" Split Spoon			Field Engineer Taylor Adams		
Sampler Hammer Automatic	Weight (lbs) 140	Drop (in) 30			

Core: 0 — 24 HR. ▼ -

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+9.8		0						
			1						
			2						
			3						
			4						
			5						-See plan on LB-2A
			6						
			7						
			8						
			9						
	-0.2		10						
			11						
			12						
			13						-Hammer casing to 15'
			14						-Refusal of casing and drillbit, move to LB-2D
			15						
			16						
			17						
			18						
			19						
			20						

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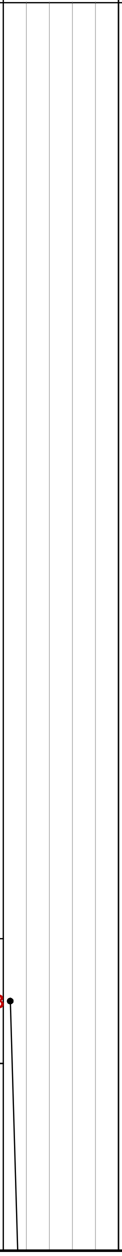
Log of Boring **LB-2D** Sheet 1 of 5

Project	76 Varick Street (2 Hudson Square)	Project No.	170470001
Location	New York, New York	Elevation and Datum	El. 9.5± (NAVD 88) NAVD 88
Drilling Company	Craig Test Boring, Inc.	Date Started / Date Finished	7/5/17 / 7/6/17
Drilling Equipment	Truck Rig	Completion Depth / Rock Depth	100 ft / 90 ft
Size and Type of Bit	2 7/8" Tricone Roller Bit	Number of Samples	Disturbed 15 / Undisturbed - / Core 2
Casing Diameter (in) / Casing Depth (ft)	4" Stainless Steel / 80	Water Level (ft.)	First ▽ - / Completion ▼ - / 24 HR. ▼ -
Casing Hammer / Weight (lbs) / Drop (in)	Automatic / 140 / 30	Drilling Foreman	Dave Cooke
Sampler	2" Split Spoon	Field Engineer	Taylor Adams
Sampler Hammer / Weight (lbs) / Drop (in)	Automatic / 140 / 30		

MATERIAL SYMBOL	Elev. (ft) +9.5	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
				0						
				1						
				2						
				3						
				4						
				5						
				6						
				7						-Dill and case to 15', see LB-2A, LB-2B, and LB-2C for first 15'
				8						
				9						
				10						
				11						
				12						
				13						
				14						
	-5.5			15				1		
▨		No Recovery		16	S-7	SS	0	2 1 2	3	-Took S-7 at 15'-17'
▨				17						
▨				18						-Drill to 20' Drilling: Smooth Wash: Brown
▨				19						
				20						



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Log of Boring **LB-2D** Sheet 2 of 5

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9.5± (NAVD 88) NAVD 88

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data Number	Sample Data Type	Sample Data Recov. (in)	Sample Data Penetr. resist BL/6in	Sample Data N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	-10.5	Olive Brown medium to fine SAND, some Silt (Wet) [Class 6]		20–22	S-8	SS	12	3 3 4 5	7	-Took S-8 at 20'-22'
				22–25						-Drill to 25' Drilling: Smooth Wash: Blackish Brown
	-14.5	Reddish Brown coarse to fine SAND, trace Silt (Wet) [Class 3B]		25–27	S-9	SS	16	3 5 5 4	10	-Took S-9 at 25'-27'
				27–30						-Drill to 30' Drilling: Smooth Wash: Reddish Brown
	-19.5	Reddish Brown coarse to fine SAND, trace Silt (Wet) [Class 6]		30–32	S-10	SS	12	5 2 3 3	5	-Took S-10 at 30'-32'
				32–35						-Drill to 35' Drilling: Smooth Wash: Reddish Brown
		Reddish Brown coarse to fine SAND, trace Silt (Wet) [Class 6]		35–37	S-11	SS	12	2 2 2 4	4	-Took S-11 at 35'-37'
				37–40						-Drill to 40' Drilling: Smooth Wash: Reddish Brown
		Reddish Brown medium to fine SAND, trace Silt (Wet) [Class 6]		40–42	S-12	SS	6	4 4 4 6	8	-Took S-12 at 40'-42'
				42–44						-Drill to 45' Drilling: Smooth Wash: Reddish Brown
	-34.5			44–45						

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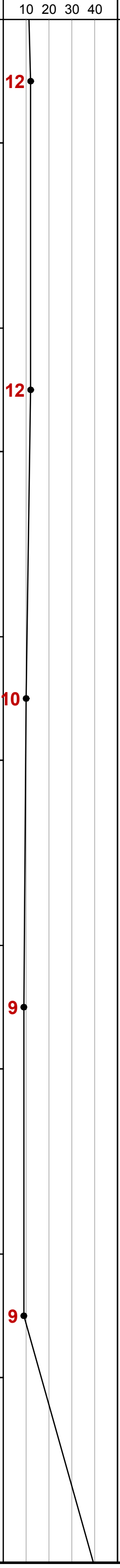
Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9.5± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-35.5			45						
	Reddish Brown coarse to fine SAND, trace Silt (Wet) [Class 3B]		45–47	S-13	SS	12	12 6 6 6	12	-Took S-13 at 45'-47'
			47–50						-Drill to 50' Drilling: Light Chatter Wash: Reddish Brown
	Reddish Brown medium to fine SAND, some Silt (Wet) [Class 3B]		50–52	S-14	SS	12	5 6 6 5	12	-Took S-14 at 50'-52'
			52–55						-Drill to 55' Drilling: Smooth Wash: Reddish Brown
	Reddish Brown fine Silty SAND (Wet) [Class 3B]		55–57	S-15	SS	10	3 4 6 5	10	-Took S-15 at 55'-57'
			57–60						-Drill to 60' Drilling: Smooth Wash: Reddish Brown
-49.5			59						
	Reddish Brown fine Silty SAND (Wet) [Class 6]		60–62	S-16	SS	16	4 3 6 4	9	-Took S-16 at 60'-62'
			62–65						-Drill to 65' Drilling: Smooth Wash: Reddish Brown
	Reddish Brown fine SAND, some Silt (Wet) [Class 6]		65–67	S-17	SS	12	4 4 5 3	9	-Took S-17 at 65'-67'
			67–70						-Drill to 70' Drilling: Smooth Wash: Reddish Brown
-59.5			69						
			70						



Project: 76 Varick Street (2 Hudson Square)	Project No.: 170470001
Location: New York, New York	Elevation and Datum: El. 9.5± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-60.5	Brown Sandy GRAVEL, trace Silt (Wet) [Class 2A]		70–72	S-18	SS	12	27 24 23 36	47	-Took S-18 at 70'-72'
			72–75						-Drill to 75' Drilling: Chatter Wash: Brown
	Brown to Red Sandy GRAVEL, trace Silt (Wet) [Class 2A]		75–77	S-19	SS	16	38 48 30 32	78	-Took S-19 at 75'-77'
			77–80						-Drill to 80' Drilling: Chatter Wash: Brown
-69.5	Reddish Brown coarse to fine SAND, some Silt (Wet) [Class 3B]		80–82	S-20	SS	12	10 7 10 17	17	-E.O.D. 7/5/17, B.O.D 7/6/17 -Case to 80' -Cleared to 80' -Took S-20 at 80'-82'
			82–85						-Drill to 85' Drilling: Light Chatter Wash: Brown
-74.5	Reddish Brown coarse to fine SAND, some Silt, trace Gravel (Wet) [Class 3A]		85–87	S-21	SS	8	13 17 26 32	43	-Took S-21 at 85'-87'
			87–90						-Drill to 90' Drilling: Rough Wash: Brown
-80.5	(GOOD) 90'-95' Grey SCHIST, coarse to fine grained Quartz, Mica, Feldspar, fresh, close to wide fractures, horizontal dipping, strong [Class 1B]	6:00 3:00 8:00 5:00 4:00	90–95	C-1	NX CORE	REC=54"/60" =90%	RQD=49"/60" =82%		-Core C-1 at 90'-95'
-85.5			95						

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Log of Boring **LB-2D** Sheet 5 of 5

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9.5± (NAVD 88) NAVD 88

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data Number	Sample Data Type	Sample Data Recov. (in)	Sample Data Penetr. resist BL/6in	Sample Data N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	-85.5	(EXCELLENT) 95'-100' Grey SCHIST, coarse to fine grained Quartz, Mica, Feldspar, fresh, moderate to wide fractures, horizontal dipping, strong [Class 1A]	8:00	95	C-2	NX CORE	REC=60"/60" =100%	RQD=60"/60" =100%		-Core C-2 at 95'-100'
			12:00	96						
			4:00	97						
			5:00	98						
			4:00	99						
	-90.5			100						-E.O.B. at 100' 7/6/17 Hole backfilled
				101						
				102						
				103						
				104						
				105						
				106						
				107						
				108						
				109						
				110						
				111						
				112						
				113						
				114						
				115						
				116						
				117						
				118						
				119						
				120						

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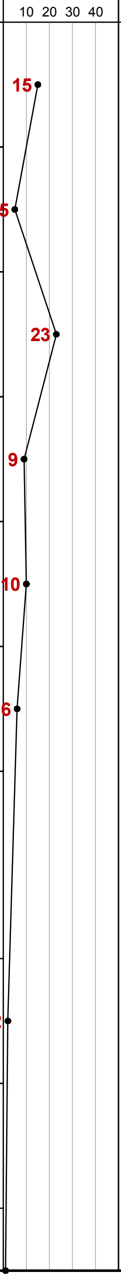
Log of Boring **LB-3** Sheet 1 of 4

Project 76 Varick Street (2 Hudson Square)		Project No. 170470001	
Location New York, New York		Elevation and Datum El. 9.6± (NAVD 88) NAVD 88	
Drilling Company Craig Test Boring, Inc.		Date Started 6/21/17	Date Finished 6/22/17
Drilling Equipment Truck Rig		Completion Depth 95 ft	Rock Depth 89 ft
Size and Type of Bit 2 7/8" Tricone Roller Bit		Number of Samples: Disturbed 22; Undisturbed -; Core 1	
Casing Diameter (in) 4.2" Stainless Steel	Casing Depth (ft) 19	Water Level (ft.): First ▽ -; Completion ▼ -; 24 HR. ▼ 11.4	
Casing Hammer Automatic; Weight (lbs) 140; Drop (in) 30		Drilling Foreman Dave Cooke	
Sampler 2" Split Spoon			
Sampler Hammer Automatic; Weight (lbs) 140; Drop (in) 30		Field Engineer Taylor Adams	

Elev. (ft) +9.6	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	Light Brown coarse to fine SAND, some Brick, some Gravel (Dry) [Class 7]		0-2	S-1	SS	12	6 8 7 4	15	-Drilling starts at 6/21/17 -Took S-1 at 0'-2'
	Brown coarse to fine SAND, some Brick (Dry) [Class 7]		2-4	S-2	SS	10	3 3 2 1	5	-Took S-2 at 2'-4' -Hammer casing to 4'
	Brown and Grey coarse to fine SAND, some Gravel, trace Concrete (Dry) [Class 7]		4-6	S-3	SS	12	3 6 17 10	23	-Cleared to 4' -Took S-3 at 4'-6'
+2.6	Brown coarse to fine SAND, trace Gravel (Dry) [Class 6]		6-8	S-4	SS	12	12 4 5 7	9	-Took S-4 at 6'-8' -Hammer casing to 8'
+1.6	Brown coarse to fine SAND, trace Silt (Moist) [Class 3B]		8-10	S-5	SS	4	3 6 4 3	10	-Cleared to 8' -Took S-5 at 8'-10'
-0.4	Brown coarse to fine SAND, trace Silt (Moist) [Class 6] ▼		10-12	S-6	SS	14	2 3 3 2	6	-Took S-6 at 10'-12'
			12-15						-Push casing to 14' -Drill to 15' Drilling: Smooth Wash: Light Brown
	Reddish Brown coarse to fine SAND, some Clay (Wet) [Class 6]		15-17	S-7	SS	4	2 1 1 1	2	-Took S-7 at 15'-17'
			17-19						-Drill to 20' Drilling: Smooth Wash: Change in water at 19'
			19-20	S-8	SS	4	1 WOH		



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Log of Boring **LB-3** Sheet 2 of 4

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9.6± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-10.4	Black PEAT, some Organic Matter, some Clay (Wet) [Class 6]		20–21	S-8	SS	4	1 2		-Took S-8 at 19'-21'
	Black PEAT, some Organic Matter, some Clay (Wet) [Class 6]		21–23	S-9	SS	14	2 2 3 2	5	-Took S-9 at 21'-23'
-14.4			24						-Push casing to 19'
	Grey Silty CLAY, some Sand (Wet) [Class 4B]		25–27	S-10	SS	20	1 2 9 8	11	-Drill to 25' Drilling: Smooth Wash: Dark Brown -Took S-10 at 25'-27'
-18.4			28						-Drill to 30' Drilling: Smooth Wash: Grey Brown
	Grey Silty CLAY, some Sand (Wet) [Class 6]		30–32	S-11	SS	24	WOH WOH WOH WOH		-Took S-11 at 30'-32'
			34						-Dril to 35' Drilling: Smooth Wash: Brown
	Brown coarse to fine SAND, trace Silt (Wet) [Class 6]		35–37	S-12	SS	16	1 3 3 2	6	-Took S-12 at 35'-37'
			38						-Drill to 40' Drilling: Smooth Wash: Brown
	Dark Grey Clayey fine SAND (Wet) [Class 6]		40–42	S-13	SS	4	2 1 WOH WOH		-Took S-13 at 40'-42'
			43–45						-Drill to 45' Drilling: Smooth Wash: Brown

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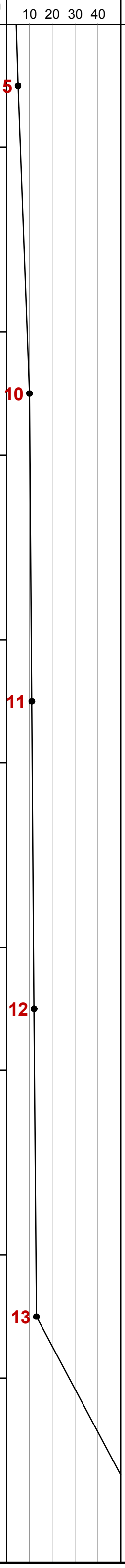
Log of Boring **LB-3** Sheet 3 of 4

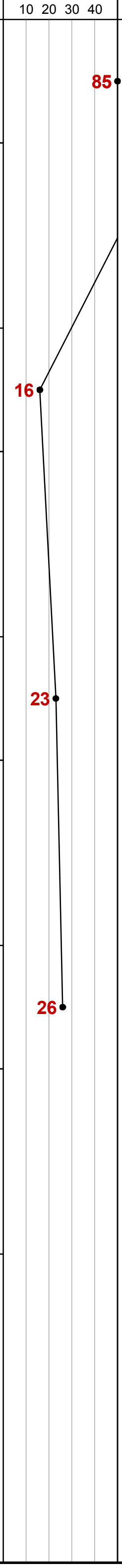
Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9.6± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-35.4			45						
	Reddish Brown medium to fine Silty SAND (Wet) [Class 6]		45–47	S-14	SS	18	3 1 4 6	5	-Took S-14 at 45'-47'
-38.4			48						
	Brown coarse to fine SAND, trace Silt (Wet) [Class 3B]		50–52	S-15	SS	8	4 5 5 4	10	-Took S-15 at 50'-52'
			53–54						-Drill to 55' Drilling: Smooth Wash: Brown
	Reddish Brown fine SAND, some Silt (Wet) [Class 3B]		55–57	S-16	SS	16	1 4 7 8	11	-Took S-16 at 55'-57'
			58–59						-Drill to 60' Drilling: Smooth Wash: Brown
	Reddish Brown coarse to fine SAND, some Silt, some Gravel (Wet) [Class 3B]		60–62	S-17	SS	6	6 7 5 4	12	-Took S-17 at 60'-62'
			63–64						-Drill to 65' Drilling: Smooth Wash: Brown
	Reddish Brown coarse to fine SAND, some Gravel, trace Silt or Clay (Wet) [Class 3B]		65–67	S-18	SS	12	14 7 6 7	13	-Took S-18 at 65'-67'
-58.4			68						
			68–70						-Drill to 70' Drilling: Chatter Wash: Reddish Brown



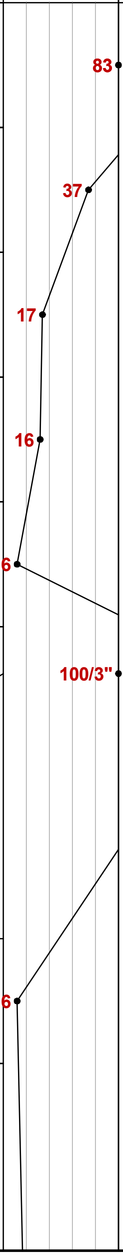
Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9.6± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-60.4	Reddish Brown coarse to fine Sandy GRAVEL, trace Silt (Wet) [Class 2A]		70–72	S-19	SS	12	20 60 25 15	85	-Took S-19 at 70'-72'
-63.4			72–75						-Drill to 75' Drilling: Smooth Wash: Brown
	Reddish Brown coarse to fine SAND, some Gravel, trace Silt (Wet) [Class 3B]		75–77	S-20	SS	4	11 8 8 11	16	-Took S-20 at 75'-77'
			77–80						-Drill to 80' Drilling: Smooth Wash: Brown
	Reddish Brown fine Clayey SAND, some Gravel (Wet) [Class 3B]		80–82	S-21	SS	2	8 11 12 13	23	-Took S-21 at 80'-82'
			82–85						-Drill to 85' Drilling: Smooth Wash: Brown
	Reddish Brown fine SAND, some Silt, trace Mica [Class 3B]		85–87	S-22	SS	24	7 11 15 18	26	-Took S-22 at 85'-87'
			87–90						-Drill to 90' Drilling: Chatter at 89' Wash: Brown and Grey
-79.4	(EXCELLENT) 90'-95' Grey SCHIST, coarse to fine Feldspar, Mica, Quartz, slightly weathered to fresh, moderate to close fractures, moderate to shallow dipping, strong [Class 1A]	5:00 5:00 4:00 3:00 4:00	90–95	C-1	NX CORE	REC=60"/60" =100%	RQD=55"/60" =92%		-Core C-1 at 90'-95' -E.O.B. at 95' 10:30AM 6/22/17 Hole backfilled with cuttings and covered with hole plug
-85.4			95						



Project: 76 Varick Street (2 Hudson Square)		Project No.: 170470001	
Location: New York, New York		Elevation and Datum: El. 9± (NAVD 88) NAVD 88	
Drilling Company: Craig Test Boring, Inc.		Date Started: 6/29/17	Date Finished: 6/29/17
Drilling Equipment: Truck Rig		Completion Depth: 98 ft	Rock Depth: 88 ft
Size and Type of Bit: 2 7/8" Tricone Roller Bit		Number of Samples: Disturbed 21	Undisturbed - Core 2
Casing Diameter (in): 4" Stainless Steel	Casing Depth (ft): 19	Water Level (ft.): First ▽ -	Completion ▼ - 24 HR. ▽ -
Casing Hammer: Automatic	Weight (lbs): 140 Drop (in): 30	Drilling Foreman: Dave Cooke	
Sampler: 2" Split Spoon		Field Engineer: Taylor Adams	
Sampler Hammer: Automatic	Weight (lbs): 140 Drop (in): 30		

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+9.0			0						
		Brown coarse to fine SAND, some Gravel, some Brick (Dry) [Class 7]		0-2	S-1	SS	15	7 51 32 29	83	-Drilling starts at 7:36AM 6/29/17 -Took S-1 at 0'-2'
		Brown to Red coarse to fine SAND, some Gravel, some Brick (Dry) [Class 7]		2-4	S-2	SS	14	21 17 20 16	37	-Took S-2 at 2'-4' -Drive casing to 4' -Cleared to 4'
		Black to Red coarse to fine SAND, some Gravel, some Brick (Moist) [Class 7]		4-6	S-3	SS	8	7 10 7 7	17	-Took S-3 at 4'-6'
		Brown to Red coarse to fine SAND, some Gravel, some Brick (Moist) [Class 7]		6-8	S-4	SS	16	7 11 5 5	16	-Took S-4 at 6'-8' -Drive casing to 8'
		Gray GRAVEL, some Concrete (Moist) [Class 7]		8-10	S-5	SS	2	4 4 2 1	6	-Cleared to 8' -Took S-5 at 8'-10'
		Red to Gray GRAVEL, some Brick, some Concrete (Moist) [Class 7]		10-11	S-6	SS	4	4 100/3"	100/3"	-Took S-6 at 10'-12' -Refusal encountered at 11' -Drill to 12' Drilling: Chatter Wash:
	-4.0			13						
		Reddish Brown coarse to fine SAND, some Silt, trace Gravel (Wet) [Class 6]		13-15						-Obstruction -Drive casing to 14' -Drill to 15' Drilling: Wash:
				15-17	S-7	SS	10	2 3 3 2	6	-Took S-7 at 15'-17'
				17-20						-Drive casing to 19'



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Log of Boring **LB-4** Sheet 2 of 5

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-11.0	Reddish Brown medium to fine SAND, some Silt (Wet) [Class 6]		20 21 22	S-8	SS	1	3 4 5 5	9	-Drill to 20' Drilling: Wash: -Took S-8 at 20'-22' -2" SS had no recovery, used 3" SS
			23 24 25						-Drill to 25' Drilling: Wash:
	Reddish Brown fine SAND, trace Silt (Wet) [Class 6]		26 27	S-9	SS	16	2 4 4 4	8	-Took S-9 at 25'-27'
			28 29 30						-Drill to 30' Drilling: Wash:
	Reddish Brown fine SAND, some Silt (Wet) [Class 6]		31 32	S-10	SS	14	3 3 5 5	8	-Took S-10 at 30'-32'
			33 34 35						-Drill to 35' Drilling: Wash:
	Reddish Brown fine SAND, some Silt (Wet) [Class 6]		36 37	S-11	SS	20	3 3 4 6	7	-Took S-11 at 35'-37'
-29.0			38 39 40						-Drill to 40' Drilling: Wash:
	Reddish Brown fine SAND, some Silt (Wet) [Class 3B]		41 42	S-12	SS	20	3 5 5 7	10	-Took S-12 at 40'-42'
			43 44 45						-Drill to 45' Drilling: Wash:

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Log of Boring **LB-4** Sheet 3 of 5

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-36.0	Reddish Brown fine SAND, some Silt (Wet) [Class 3B]		45-47	S-13	SS	18	3 4 6 5	10	-Took S-13 at 45'-47'
			47-50						-Drill to 50' Drilling: Wash:
	Reddish Brown fine SAND, some Silt (Wet) [Class 3B]		50-52	S-14	SS	20	4 6 6 8	12	-Took S-14 at 50'-52'
			52-55						-Drill to 55' Drilling: Wash:
	Reddish Brown Silty fine SAND (Wet) [Class 3B]		55-57	S-15	SS	18	4 4 6 7	10	-Took S-15 at 55'-57'
			57-60						-Drill to 60' Drilling: Wash:
	Reddish Brown medium to fine SAND, some Silt (Wet) [Class 3B]		60-62	S-16	SS	14	3 6 7 7	13	-Took S-16 at 60'-62'
			62-65						-Drill to 65' Drilling: Wash:
	Reddish Brown medium to fine SAND, some Silt (Wet) [Class 3B]		65-67	S-17	SS	14	3 5 5 7	10	-Took S-17 at 65'-67'
-59.0			67-68						
			68-70						-Rod chattering, obstruction -Drill to 70' Drilling: Wash:
-61.0			70						

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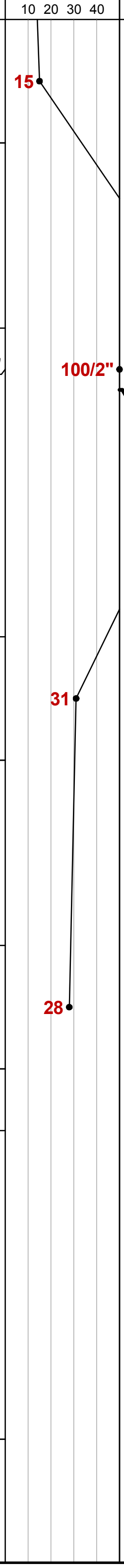
Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-61.0			70						
	Reddish Brown Silty fine SAND (Wet) [Class 3B]		70-72	S-18	SS	12	12 8 7 12	15	-Took S-18 at 70'-72'
-65.0			74						
	Reddish Brown medium to fine SAND, trace Silt, some Decomposed Rock (Wet) [Class 3A]		75	S-19	SS	4	24 100/2"	100/2"	-Drill to 75' Drilling: Wash: -Took S-19 at 75'-77'
			78						-Drill to 80' Drilling: Wash:
	Reddish Brown coarse to fine SAND, trace Silt (Wet) [Class 3A]		80-82	S-20	SS	24	16 17 14 16	31	-Took S-20 at 80'-82'
			83						-Drill to 85' Drilling: Wash:
	Reddish Brown coarse to fine SAND, some Gravel, trace Silt (Wet) [Class 3A]		85-87	S-21	SS	12	11 11 17 31	28	-Took S-21 at 85'-87' -Rod chattering
-79.0		10:37	88-89						-Drill to 88' Drilling: Wash:
		3:59	89-90						
	(GOOD) 88'-93' Gray micaceous SCHIST, fine to coarse grained Quartz-Garnet-Feldspar, slightly weathered, very close to moderate fracture spacing, fractures shallow dipping to near horizontal [Class 1A]	9:52	90-91	C-1	NX Core	REC=57"/60" =95%	RQD=51"/60" =85%		-Obstruction -Core C-1 at 88'-93'
		4:01	91-92						
		7:36	92-93						
		5:36	93-94	C-2	NX Core				
		4:11	94-95						



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Log of Boring **LB-4** Sheet 5 of 5

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9± (NAVD 88) NAVD 88

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data					Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
					Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	
	-86.0	(EXCELLENT) 93'-98' Gray micaceous SCHIST, fine to coarse grained, fresh, very close to moderate fracture spacing, fractures shallow dipping to near horizontal [Class 1A]	7:08 8:25 8:10	95 96 97	C-2	NX Core	REC=60"/60" =100%	RQD=57"/60" =95%		-Core C-2 at 93'-98'
	-89.0			98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120						-E.O.B. at 98' 1:29PM 6/29/17 Hole backfilled and grouted

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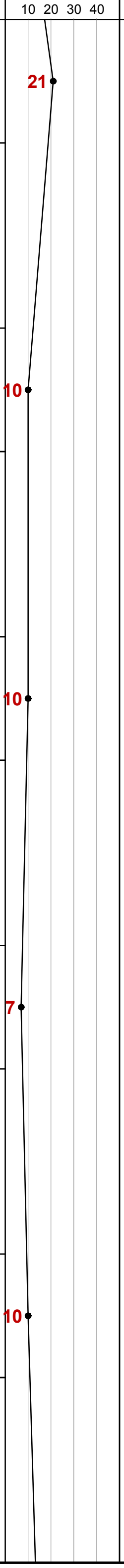
Log of Boring **LB-5** Sheet 1 of 5

Project	76 Varick Street (2 Hudson Square)	Project No.	170470001
Location	New York, New York	Elevation and Datum	El. 9.2± (NAVD 88) NAVD 88
Drilling Company	Craig Test Boring, Inc.	Date Started / Date Finished	6/30/17 / 6/30/17
Drilling Equipment	Truck Rig	Completion Depth / Rock Depth	98 ft / 88 ft
Size and Type of Bit	2 7/8" Tricone Roller Bit	Number of Samples	Disturbed 21 / Undisturbed - / Core 2
Casing Diameter (in) / Casing Depth (ft)	4" Stainless Steel / 69	Water Level (ft.)	First ▽ - / Completion ▼ - / 24 HR. ▼ -
Casing Hammer / Weight (lbs) / Drop (in)	Automatic / 140 / 30	Drilling Foreman	Dave Cooke
Sampler	2" Split Spoon	Field Engineer	Taylor Adams
Sampler Hammer / Weight (lbs) / Drop (in)	Automatic / 140 / 30		

Elev. (ft) +9.2	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	Red to Gray coarse to fine SAND, some Gravel, trace Silt, some Brick (Dry) [Class 7]	0–2	S-1	SS	24	10 28 17 10	45	-Drilling starts at 7:11AM 6/30/17 -Took S-1 at 0'-2'
	Red to Brown coarse to fine SAND, some Gravel, trace Silt, some Brick (Dry) [Class 7]	2–4	S-2	SS	20	4 4 5 4	9	-Took S-2 at 2'-4' -Drive casing to 4'
	Reddish Brown coarse to fine SAND, trace Silt (Dry) [Class 7]	4–6	S-3	SS	18	4 3 4 4	7	-Cleared to 4' -Took S-3 at 4'-6'
	Reddish Brown coarse to fine SAND, trace Silt (Dry) [Class 7]	6–8	S-4	SS	16	3 3 4 3	7	-Took S-4 at 6'-8' -Drive casing to 8'
+1.2	Reddish Brown coarse to fine SAND, trace Silt (Moist) [Class 6]	8–10	S-5	SS	6	2 1 1 2	2	-Cleared to 8' -Took S-5 at 8'-10'
	Black PEAT (Moist) [Class 6]	10–12	S-6	SS	8	2 2 3 3	5	-Took S-6 at 10'-12'
		12–15						-Drive casing to 14' -Drill to 15' Drilling: Wash:
	Dark Brown Clayey medium to fine SAND, some Peat (Wet) [Class 6]	15–17	S-7	SS	18	WOH WOH 2 4		-Took S-7 at 15'-17'
-8.8		18–20						-Rod chattering -Drill to 20' Drilling: Wash:

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9.2± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-10.8	Reddish Brown coarse to fine SAND, trace Silt (Wet) [Class 3B]	20-22	S-8	SS	6	9 10 11 13	21	-Took S-8 at 20'-22'
		22-25						-Drive casing to 24', rod chattering -Drill to 25' Drilling: Wash:
	Reddish Brown medium to fine SAND, trace Silt (Wet) [Class 3B]	25-27	S-9	SS	2	4 5 5 7	10	-Took S-9 at 25'-27'
		27-30						-Drill to 30' Drilling: Wash:
	Reddish Brown medium to fine SAND, trace Silt, trace Gravel (Wet) [Class 3B]	30-32	S-10	SS	8	5 5 5 5	10	-Took S-10 at 30'-32'
-24.8		32-35						-Drill to 35' Drilling: Wash:
	Reddish Brown coarse to fine SAND, trace Silt (Wet) [Class 6]	35-37	S-11	SS	8	5 3 4 4	7	-Took S-11 at 35'-37'
-27.8		37-40						-Drill to 40' Drilling: Wash:
	Reddish Brown coarse to fine SAND, trace Silt, trace Gravel (Wet) [Class 3B]	40-42	S-12	SS	6	7 5 5 6	10	-Took S-12 at 40'-42'
		42-45						-Drive casing to 44' -Drill to 45' Drilling: Wash:



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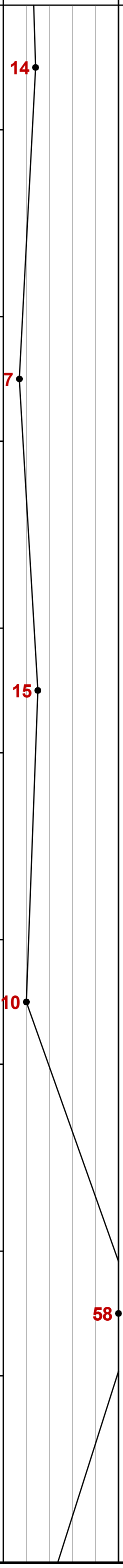
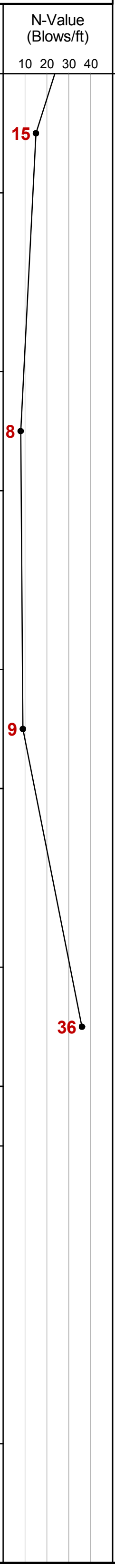
Log of Boring **LB-5** Sheet 3 of 5

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9.2± (NAVD 88) NAVD 88

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	-35.8	Brown coarse to fine SAND, some Gravel (Wet) [Class 3B]		45–47	S-13	SS	6	6 7 7 14	14	-Took S-13 at 45'-47'
	-37.8	Brown Gravelly coarse to fine SAND (Wet) [Class 6]		47–50						-Rod chattering -Drive casing to 49' -Drill to 50' Drilling: Wash:
				50–52	S-14	SS	2	4 4 3 5	7	-Took S-14 at 50'-52'
				52–54						-Drive casing to 54'
	-44.8			54–55						-Drill to 55' Drilling: Wash:
		Reddish Brown medium to fine SAND, trace Silt (Wet) [Class 3B]		55–57	S-15	SS	8	6 6 9 13	15	-Took S-15 at 55'-57'
				57–60						-Drill to 60' Drilling: Wash:
		Reddish Brown medium to fine SAND, trace Silt (Wet) [Class 3B]		60–62	S-16	SS	8	4 5 5 4	10	-Took S-16 at 60'-62'
	-53.8			62–65						-Drill to 65' Drilling: Wash:
		Brown coarse to fine SAND, some Gravel (Wet) [Class 3A]		65–67	S-17	SS	8	23 37 21 23	58	-Took S-17 at 65'-67'
	-58.8			67–70						-Rod chattering -Drive casing to 69' -Drill to 70' Drilling: Wash:



Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9.2± (NAVD 88) NAVD 88



Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-60.8	Brown medium to fine SAND, some Silt, trace Gravel (Wet) [Class 3B]		70	S-18	SS	8	14 10 5 6	15	-Took S-18 at 70'-72'
			73						-Rod chattering
-64.8	Reddish Brown Silty fine SAND (Wet) [Class 6]		74						-Drill to 75' Drilling: Wash:
			75	S-19	SS	12	3 4 4 4	8	-Took S-19 at 75'-77'
-68.8	Reddish Brown Silty fine SAND (Wet) [Class 3B]		78						-Drill to 80' Drilling: Wash:
			80	S-20	SS	8	3 5 4 5	9	-Took S-20 at 80'-82'
			83						-Drill to 85' Drilling: Wash:
-74.8	Reddish Brown fine SAND (Wet) [Class 3A]		84						
			85	S-21	SS	12	12 18 18 20	36	-Took S-21 at 85'-87'
			87						-Drill to 88' Drilling: Chatter Wash:
-78.8	(GOOD) 88'-93' Gray micaceous SCHIST, fine to coarse grained Feldspar-Quartz-Garnet, fresh, close to moderate fracture spacing, fractures shallow dipping [Class 1B]	4:54 3:49 2:03 4:25 3:24	88	C-1	NX Core	REC=54"/60" =90%	RQD=51"/60" =85%		-Core C-1 at 88'-93'
		5:45 4:12	93	C-2	NX Core				
			95						

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Log of Boring **LB-5** Sheet 5 of 5

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9.2± (NAVD 88) NAVD 88

MATERIAL SYMBOL	Elev. (ft) -85.8	Sample Description	Coring (min)	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		(GOOD) 93'-98' Gray micaceous SCHIST, fine to coarse grained Feldspar-Quartz-Garnet, slightly weathered, very close to moderate fracture spacing, fractures shallow dipping [Class 1B]	4:23	95	C-2	NX Core	REC=54"/60" =90%	RQD=50"/60" =83%		-Core C-2 at 93'-98'
			2:15	96						
			3:46	97						
	-88.8			98						-E.O.B. at 98' 1:35PM 6/30/17 Hole backfilled
				99						
				100						
				101						
				102						
				103						
				104						
				105						
				106						
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				120						

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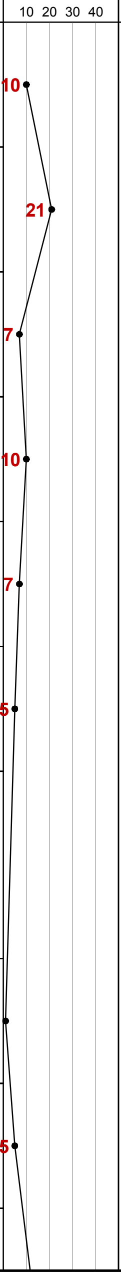
Log of Boring **LB-6** Sheet 1 of 5

Project: 76 Varick Street (2 Hudson Square)		Project No.: 170470001	
Location: New York, New York		Elevation and Datum: El. 8.6± (NAVD 88) NAVD 88	
Drilling Company: Craig Test Boring, Inc.		Date Started: 6/22/17	Date Finished: 6/26/17
Drilling Equipment: Truck Rig		Completion Depth: 97 ft	Rock Depth: 86 ft
Size and Type of Bit: 2 7/8" Tricone Roller Bit		Number of Samples: Disturbed 22 / Undisturbed - / Core 2	
Casing Diameter (in): 4.25" Stainless Steel	Casing Depth (ft): 59	Water Level (ft.): First ▽ - / Completion ▼ - / 24 HR. ▼ -	
Casing Hammer: Automatic	Weight (lbs): 140 / Drop (in): 30	Drilling Foreman: Dave Cooke	
Sampler: 2" Split Spoon		Field Engineer: Taylor Adams	
Sampler Hammer: Automatic	Weight (lbs): 140 / Drop (in): 30		



Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+8.6	Reddish Brown coarse to fine SAND, some Gravel, some Brick (Dry) [Class 7]	0–2	S-1	SS	12	4 5 5 6	10	-Drilling starts at 11:00AM 6/22/17 -Took S-1 at 0'-2'
	Brown coarse to fine SAND, some Gravel (Dry) [Class 7]	2–4	S-2	SS	8	6 9 12 8	21	-Took S-2 at 2'-4'
	Brown coarse to fine SAND, some Brick (Dry) [Class 7]	4–6	S-3	SS	4	5 4 3 4	7	-Hammer casing to 4' -Cleared to 4' -Took S-3 at 4'-6'
	Brown coarse to fine SAND (Dry) [Class 7]	6–8	S-4	SS	2	5 5 5 4	10	-Took S-4 at 6'-8'
+0.6	Brown coarse to fine SAND, trace Silt (Dry) [Class 6]	8–10	S-5	SS	14	3 4 3 3	7	-Hammer casing to 8' -Cleared to 8' -Took S-5 at 8'-10'
	Brown coarse to fine SAND, trace Silt (Moist) [Class 6]	10–12	S-6	SS	8	2 3 2 2	5	-Took S-6 at 10'-12'
		12–15						-Hammer casing to 14' -Drill to 15' Drilling: Smooth Wash: Dark Brown
	Blackish Brown PEAT, some Plant Fibers (Wet) [Class 6]	15–17	S-7	SS	18	WOH WOH 1 2		-Took S-7 at 15'-17'
	Blackish Brown PEAT, some Plant Fibers (Wet) [Class 6]	17–19	S-8	SS	16	1 2 3 3	5	-Took S-8 at 17'-19'
-11.4		19–20						-Drill to 20' Drilling: Smooth Wash: Brown

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Log of Boring **LB-6** Sheet 2 of 5

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 8.6± (NAVD 88) NAVD 88

Material Symbol	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data: Number	Sample Data: Type	Sample Data: Recov. (in)	Sample Data: Penetr. resist BL/6in	Sample Data: N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	-11.4	Olive Brown coarse to fine SAND, some Gravel, some Clayey Silt (Wet) [Class 3B]		20–22	S-9	SS	16	3 4 11 9	15	-Took S-9 at 20'-22'
				22–25						-Drill to 25' Drilling: Chatter at 24' Wash: Brown
	-15.4			24						
		Grey Brown fine Silty SAND (Wet) [Class 6]		25–27	S-10	SS	24	4 3 2 2	5	-Took S-10 at 25'-27'
				27–30						-Drill to 30' Drilling: Smooth Wash: Brown
		Reddish Brown Silty Clayey fine SAND (Wet) [Class 6]		30–32	S-11	SS	20	2 1 1 1	2	-Took S-11 at 30'-32'
				32–35						-Drill to 35' Drilling: Smooth Wash: Reddish Brown
		Brown coarse to fine Gravely SAND, some Silt (Wet) [Class 6]		35–37	S-12	SS	10	4 4 5 3	9	-Took S-12 at 35'-37'
				37–40						-Drill to 40' Drilling: Smooth Wash: Reddish Brown
		Brown coarse to fine Gravely SAND, some Silt (Wet) [Class 6]		40–42	S-13	SS	10	5 5 4 6	9	-Took S-13 at 40'-42'
				42–45						-Drill to 45' Drilling: Smooth Wash: Brown
	-35.4			44						

N-Value scale: 10 20 30 40

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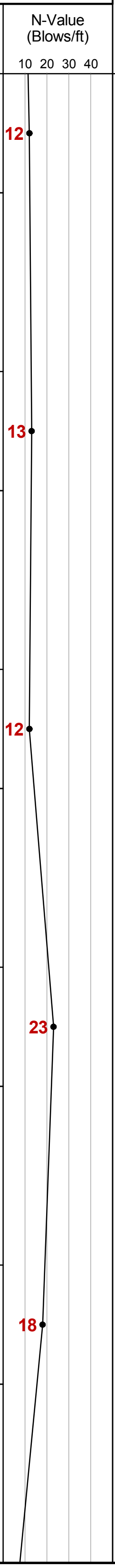
Log of Boring **LB-6** Sheet 3 of 5

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 8.6± (NAVD 88) NAVD 88



Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-36.4	Brown coarse to fine SAND, some Gravel, trace Silt (Wet) [Class 3B]		45–47	S-14	SS	8	5 5 7 5	12	-Took S-14 at 45'-47'
			47–50						-Drill to 50' Drilling: Chatter at 48' Wash: Brown
	Brown coarse to medium SAND, some Gravel (Wet) [Class 3B]		50–52	S-15	SS	6	18 7 6 5	13	-Took S-15 at 50'-52'
-44.4 -45.4			52–55						-Drill to 55' Drilling: Slow, stop at 53', chatter Wash: Brown -Possible obstruction
	Reddish Brown coarse to fine SAND, some Gravel (Wet) [Class 3B]		55–57	S-16	SS	12	6 7 5 4	12	-Took S-16 at 55'-57'
			57–60						-Drill to 60' Drilling: Slow, chatter Wash: Brown
	Reddish Brown coarse to fine Gravely SAND (Wet) [Class 3B]		60–62	S-17	SS	4	18 12 11 10	23	-Took S-17 at 60'-62'
			62–65						-Drill to 65' Drilling: Light chatter Wash: Brown
	Reddish Brown fine Silty SAND, some Gravel (Wet) [Class 3B]		65–67	S-18	SS	4	13 9 9 8	18	-Took S-18 at 65'-67'
			67–68						-Hammer casing to 59'
-59.4			68–70						-Drill to 70' Drilling: Smooth Wash: Brown

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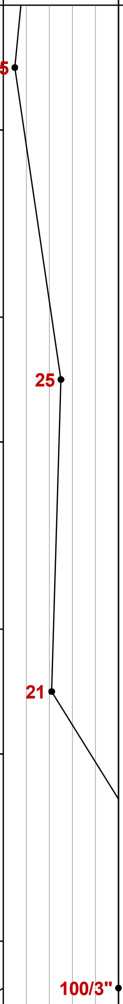
Log of Boring **LB-6** Sheet 4 of 5

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 8.6± (NAVD 88) NAVD 88

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	-61.4	Reddish Brown fine Silty SAND (Wet) [Class 6]		70–72	S-19	SS	18	4 2 3 4	5	-Took S-19 at 70'-72'
				72–75						-Drill to 75' Drilling: Smooth Wash: Brown
	-65.4	Reddish Brown fine SAND, some Silt (Wet) [Class 3B]		75–77	S-20	SS	14	7 10 15 13	25	-Took S-20 at 75'-77'
				77–80						-Drill to 80' Drilling: Smooth Wash: Brown
		Reddish Brown medium to fine SAND, some Silt (Wet) [Class 3B]		80–82	S-21	SS	16	8 10 11 13	21	-Took S-21 at 80'-82'
				82–85						-Drill to 85' Drilling: Smooth Wash: Brown
				85	S-22	SS	6	12 100/3"	100/3"	-Took S-22 at 85'-87'
	-77.4	Reddish Brown medium to fine SAND, some Silt, some Decomposed Rock (Wet) [Class 3B]		86–87						-Clear to 87'
		(EXCELLENT) 87'-92' Grey coarse to fine grained SCHIST, fresh, wide to close fractures, shallow dipping, strong [Class 1A]	4:00 4:00 5:00 5:00 4:00	87–92	C-1	NX CORE	REC=59"/60" =98%	RQD=59"/60" =98%		-Core C-1 at 87'-92'
	-83.4	(GOOD)	3:00 3:00 5:00	92–95	C-2	NX CORE	REC=54"/60" =90%	RQD=50"/60" =83%		-Core C-2 at 92'-97'



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Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 8.6± (NAVD 88) NAVD 88

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data					Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
					Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	
	-86.4 -88.4	92'-97' Grey coarse to fine grained SCHIST, Mica, Quartz, fresh, medium to close fractures, shallow dipping, strong [Class 1B]	5:00 6:00	95 96 97	C-2	NX CORE				-E.O.B. at 97' 11:30AM 6/26/17 Hole backfilled with cuttings
				98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120						

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Log of Boring **LB-7** Sheet 1 of 5

Project	76 Varick Street (2 Hudson Square)	Project No.	170470001
Location	New York, New York	Elevation and Datum	El. 8.8± (NAVD 88) NAVD 88
Drilling Company	Craig Test Boring, Inc.	Date Started / Date Finished	6/15/17 / 6/15/17
Drilling Equipment	Truck Rig	Completion Depth / Rock Depth	97 ft / 87 ft
Size and Type of Bit	2 7/8" Tricone Roller Bit	Number of Samples	Disturbed 21; Undisturbed -; Core 2
Casing Diameter (in) / Casing Depth (ft)	4" Stainless Steel / 39	Water Level (ft.)	First ▽ -; Completion ▼ -; 24 HR. ▼ 10.5
Casing Hammer / Weight (lbs) / Drop (in)	Automatic / 140 / 30	Drilling Foreman	Dave Cooke
Sampler	2" Split Spoon		
Sampler Hammer / Weight (lbs) / Drop (in)	Automatic / 140 / 30	Field Engineer	Taylor Adams

MATERIAL SYMBOL	Elev. (ft) +8.8	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Brown coarse to fine SAND, trace Gravel, trace Brick (Dry) [Class 7]		0–2	S-1	SS	13	5 13 18 12	31	-Drilling starts at 8:00AM 6/15/17 -Took S-1 at 0'-2'
		Grey and Red coarse to fine SAND, some Brick, trace Gravel (Dry) [Class 7]		2–4	S-2	SS	10	9 18 12 10	30	-Took S-2 at 2'-4'
		Brown GRAVEL, trace Sand, trace Brick (Moist) [Class 7]		4–6	S-3	SS	3	2 2 3 3	5	-Hammer casing to 4' -Cleared to 4' -Took S-3 at 4'-6'
		Brown coarse to fine SAND, some Brick, trace Gravel (Moist) [Class 7]		6–8	S-4	SS	8	4 3 5 2	8	-Took S-4 at 6'-8'
		Brown GRAVEL (Moist) [Class 7]		8–10	S-5	SS	2	3 2 1 100/3"	3	-Hammer casing to 8' -Cleared to 8' -Took S-5 at 8'-10'
		Reddish Brown coarse to fine SAND, some Gravel, trace Silt (Wet) [Class 7]	▼	10–12	S-6	SS	12	7 3 4 4	7	-Took S-6 at 10'-12'
				12–13						
▨	-4.2	No Recovery		13–15						-Drill to 15' Drilling: Smooth Wash: Light Brown
▨				15–17	S-7	SS	0	10 9 11 6	20	-Took S-7 at 15'-17'
▨				17–18						
▒	-9.2			18–20						-Hammer casing to 19' -Drill to 20' Drilling: Smooth Wash: Brown

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 8.8± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-11.2		20						
	Reddish Brown coarse to fine SAND (Wet) [Class 6]	20–22	S-8	SS	2	3 4 4 4	8	-Took S-8 at 20'-22'
		22–25						-Drill to 25' Drilling: Smooth Wash: Brown
	Reddish Brown coarse to fine SAND, trace Gravel (Wet) [Class 6]	25–27	S-9	SS	0	4 4 5 5	9	-Took S-9 at 25'-27' Took 3" O.D. Split Spoon: Recovery 12"
		27–30						-Drill to 30' Drilling: Smooth Wash: Brown
	Reddish Brown medium to fine SAND (Wet) [Class 6]	30–32	S-10	SS	6	3 4 4 3	8	-Took S-10 at 30'-32'
		32–35						-Drill to 35' Drilling: Smooth Wash: Reddish Brown
	Reddish Brown medium to fine SAND, some Silt (Wet) [Class 6]	35–37	S-11	SS	24	2 3 3 3	6	-Took S-11 at 35'-37'
-29.2		38						-Drill to 40 Drilling: Smooth Wash: Red/Brown
	Reddish Brown medium to fine SAND, some Silt (Wet) [Class 3B]	40–42	S-12	SS	16	3 5 7 7	12	-Took S-12 at 40'-42'
-34.2		43						-Drill to 45' Drilling: Smooth Wash: Reddish Brown
		45						

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Log of Boring **LB-7** Sheet 3 of 5

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 8.8± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-36.2	Reddish Brown medium to fine SAND, some Silt (Wet) [Class 6]		45 - 47	S-13	SS	14	2 3 4 5	7	-Took S-13 at 45' - 47'
			47 - 50						-Drill to 50' Drilling: Smooth Wash: Reddish Brown
	Reddish Brown medium to fine SAND, some Silt (Wet) [Class 6]		50 - 52	S-14	SS	14	2 2 6 5	8	-Took S-14 at 50'-52'
			52 - 55						-Drill to 55' Drilling: Smooth Wash: Reddish Brown
	Reddish Brown medium to fine Silty SAND (Wet) [Class 6]		55 - 57	S-15	SS	22	2 3 4 4	7	-Took S-15 at 55'-57'
-49.2			57 - 60						-Drill to 60' Drilling: Smooth Wash: Reddish Brown
	Reddish Brown medium to fine SAND, some Silt (Wet) [Class 3B]		60 - 62	S-16	SS	14	3 4 6 4	10	-Took S-16 at 60'-62'
			62 - 65						-Drill to 65' Drilling: Smooth Wash: Reddish Brown
	Reddish Brown fine SAND, trace Silt (Wet) [Class 3B]		65 - 67	S-17	SS	10	5 6 8 10	14	-Took S-17 at 65'-67'
			67 - 70						-Drill to 70' Drilling: Smooth Wash: Reddish Brown

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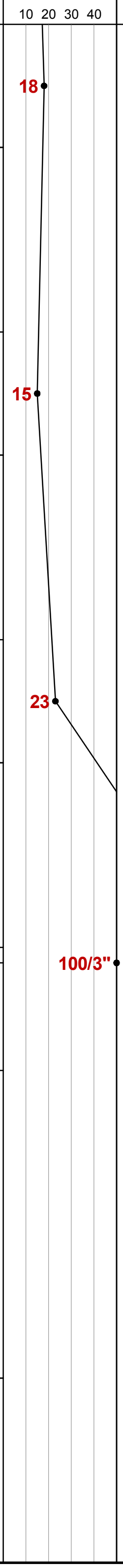
LANGAN Log of Boring **LB-7** Sheet 4 of 5

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 8.8± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-61.2			70						
	Reddish Brown medium to fine Silty SAND (Wet) [Class 3B]		70-72	S-18	SS	12	4 8 10 11	18	-Took S-18 at 70'-72'
			72-75						-Drill to 75' Drilling: Smooth Wash: Reddish Brown
	Reddish Brown medium to fine Silty SAND (Wet) [Class 3B]		75-77	S-19	SS	24	5 7 8 13	15	-Took S-19 at 75'-77'
			77-80						-Drill to 80' Drilling: Smooth Wash: Reddish Brown
	Reddish Brown coarse to fine SAND, some Silt (Wet) [Class 3B]		80-82	S-20	SS	16	3 8 15 18	23	-Took S-20 at 80'-82'
			82-85						-Drill to 85' Drilling: Smooth Wash: Reddish Brown
-76.2	Grey and White WEATHERED ROCK (Wet) [Class 1D]		85	S-21	SS	2	100/3"	100/3"	-Took S-21 at 85'-87' -Drill to 87' Drilling: Rig Chatter/Slow Wash: Brown
-77.2			86						
	(GOOD) 87' - 92' Grey SCHIST, medium to fine grained Quartz, slightly weathered to fresh, moderate to close fractures, shallow dipping, strong [Class 1B]	5:30 10:00 6:00 4:00 5:00	87-92	C-1	NX CORE	REC=57"/60" =95%	RQD=47"/60" =78%		-Core C-1 at 87'-92'
	(EXCELLENT)	5:00 5:00 6:00	92-95	C-2	NX CORE	REC=57"/60" =95%	RQD=57"/60" =95%		-Advanced casing to 39' due to hole collapse -Core C-2 at 92'-97'



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Log of Boring **LB-7** Sheet 5 of 5

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 8.8± (NAVD 88) NAVD 88

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data Number	Sample Data Type	Sample Data Recov. (in)	Sample Data Penetr. resist BL/6in	Sample Data N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	-86.2	92'-97' Grey SCHIST, medium to fine grained Quartz, Mica, slightly weathered to fresh, moderate fractures, shallow dipping, strong [Class 1A]	5:00	95	C-2	NX CORE				
			5:00	96						
	-88.2			97						-E.O.B. at 97' 2:00PM 6/15/17 Hole backfilled and covered with hole plug
				98						
				99						
				100						
				101						
				102						
				103						
				104						
				105						
				106						
				107						
				108						
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				115						
				116						
				117						
				118						
				119						
				120						

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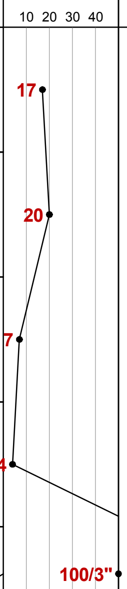
Log of Boring **LB-8A** Sheet 1 of 1

Project: 76 Varick Street (2 Hudson Square)		Project No.: 170470001	
Location: New York, New York		Elevation and Datum: El. 8.9± (NAVD 88) NAVD 88	
Drilling Company: Craig Test Boring, Inc.		Date Started: 6/27/17	Date Finished: 6/27/17
Drilling Equipment: Truck Rig		Completion Depth: 10 ft	Rock Depth: -
Size and Type of Bit: 2 7/8" Tricone Roller Bit		Number of Samples: Disturbed 5	Undisturbed - Core 0
Casing Diameter (in): 4" Stainless Steel	Casing Depth (ft): 8	Water Level (ft.): First ▽ -	Completion ▼ - 24 HR. ▼ -
Casing Hammer: Automatic	Weight (lbs): 140 Drop (in): 30	Drilling Foreman: Dave Cooke	
Sampler: 2" Split Spoon			
Sampler Hammer: Automatic	Weight (lbs): 140 Drop (in): 30	Field Engineer: Taylor Adams	

MATERIAL SYMBOL	Elev. (ft) +8.9	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
			0					-Drilling starts at 6/27/17
		Reddish Brown coarse to fine SAND, some Brick, trace Gravel (Dry) [Class 7]	1	S-1	SS	18	4 7 10 8	-Took S-1 at 0'-2'
		Brown coarse to fine SAND, some Gravel, trace Brick (Dry) [Class 7]	2–3	S-2	SS	6	9 8 12 8	-Took S-2 at 2'-4'
		Brown coarse to fine SAND, some Gravel (Dry) [Class 7]	4–5	S-3	SS	2	3 3 4 2	-Hammer casing to 4' -Cleared to 4' -Took S-3 at 4'-6'
		Brown and Grey coarse to fine SAND, some Concrete (Moist) [Class 7]	6–7	S-4	SS	8	4 2 2 2	-Took S-4 at 6'-8'
		Brown coarse to fine SAND, Grey Concrete (Wet) [Class 7]	8–9	S-5	SS	4	2 100/3"	-Hammer casing to 8' -Cleared to 8' -Took S-5 at 8'-10' -Cleared to 10', heavy chatter
	-1.1		10					-Obstruction at 9', unable to drill past -Move hole to LB-8B
			11					
			12					
			13					
			14					
			15					
			16					
			17					
			18					
			19					
			20					

N-Value (Blows/ft)



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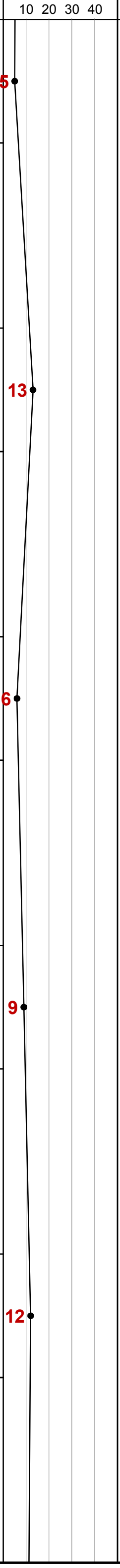
Log of Boring **LB-8B** Sheet 1 of 4

Project: 76 Varick Street (2 Hudson Square)		Project No.: 170470001	
Location: New York, New York		Elevation and Datum: El. 8.9± (NAVD 88) NAVD 88	
Drilling Company: Craig Test Boring, Inc.		Date Started: 6/27/17	Date Finished: 6/28/17
Drilling Equipment: Truck Rig		Completion Depth: 85 ft	Rock Depth: 74 ft
Size and Type of Bit: 2 7/8" Tricone Roller Bit		Number of Samples: Disturbed 12	Undisturbed - Core 2
Casing Diameter (in): 4" Stainless Steel	Casing Depth (ft): 19	Water Level (ft.): First ▽ -	Completion ▼ - 24 HR. ▼ -
Casing Hammer: Automatic	Weight (lbs): 140 Drop (in): 30	Drilling Foreman: Dave Cooke	
Sampler: 2" Split Spoon		Field Engineer: Taylor Adams	
Sampler Hammer: Automatic	Weight (lbs): 140 Drop (in): 30		

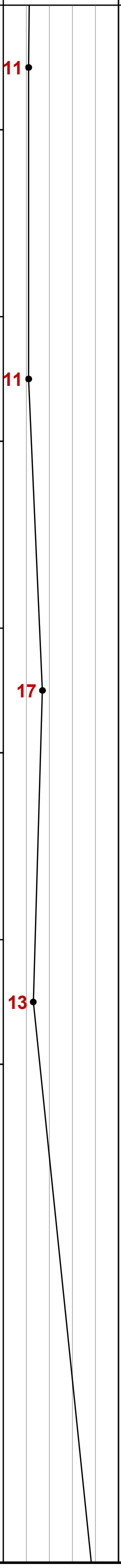
Elev. (ft) +8.9	Sample Description	Depth Scale	Sample Data Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		0–10						-See LB-8A for 0'-10' -LB-8B is 10' E and 8' N of LB-8A -Drill to 10' Drilling: Chatter at 10' Wash: Brown -Hammer casing to 9'
-1.1	Reddish Brown coarse to fine SAND, some Gravel (Wet) [Class 6]	10–12	S-6	SS	4	3 4 3 2	7	-Took S-6 at 10'-12' -E.O.D. 2:15PM 6/27/17 -B.O.D. 7:15AM 6/28/17
		12–15						-Drill to 15' Drilling: Smooth Wash: Brown -Hammer casing to 14'
	Reddish Brown medium to fine SAND, trace Silt (Wet) [Class 6]	15–17	S-7	SS	10	2 3 3 3	6	-Took S-7 at 15'-17'
		17–20						-Hammer casing to 19' -Drill to 20' Drilling: Smooth Wash: Brown

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 8.9± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-11.1			20						
	Reddish Brown medium to fine SAND, trace Silt (Wet) [Class 6]		20-22	S-8	SS	18	3 2 3 4	5	-Took S-8 at 20'-22'
			22-25						-Drill to 25' Drilling: Smooth Wash: Reddish Brown
-15.1			24						
	Reddish Brown medium to fine SAND, some Silt (Wet) [Class 3B]		25-27	S-9	SS	6	3 6 7 6	13	-Took S-9 at 25'-27'
			27-30						-Drill to 30' Drilling: Smooth Wash: Reddish Brown
-19.1			28						
	Reddish Brown fine SAND, some Silt (Wet) [Class 6]		30-32	S-10	SS	18	3 2 4 5	6	-Took S-10 at 30'-32'
			32-35						-Drill to 35' Drilling: Smooth Wash: Reddish Brown
	Reddish Brown medium to fine SAND, some Silt (Wet) [Class 6]		35-37	S-11	SS	18	3 4 5 6	9	-Took S-11 at 35'-37'
			37-40						-Drill to 40' Drilling: Smooth Wash: Reddish Brown
-29.1			38						
	Reddish Brown medium to fine SAND, some Silt (Wet) [Class 3B]		40-42	S-12	SS	16	6 5 7 7	12	-Took S-12 at 40'-42'
			42-45						-Drill to 45' Drilling: Smooth Wash: Reddish Brown
			45						



Project	Project No.
76 Varick Street (2 Hudson Square)	170470001
Location	**Elevation and Datum**
New York, New York	El. 8.9± (NAVD 88) NAVD 88



MATERIAL SYMBOL	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data					Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
					Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	
	-36.1			45						
		Reddish Brown medium to fine SAND, some Silt (Wet) [Class 3B]		46	S-13	SS	18	4 5 6 7	11	-Took S-13 at 45'-47'
				47						
				48						-Drill to 50' Drilling: Smooth Wash: Reddish Brown
				49						
				50						
		Reddish Brown fine SAND, some Silt (Wet) [Class 3B]		51	S-14	SS	16	3 5 6 7	11	-Took S-14 at 50'-52'
				52						
				53						-Drill to 55' Drilling: Smooth Wash: Reddish Brown
	-45.1			54						
				55						
		Reddish Brown fine Sandy SILT (Wet) [Class 5B]		56	S-15	SS	24	4 6 11 14	17	-Took S-15 at 55'-57'
				57						
	-49.1			58						-Drill to 60' Drilling: Smooth Wash: Reddish Brown
				59						
				60						
		Reddish Brown medium to fine SAND, some Silt (Wet) [Class 3B]		61	S-16	SS	18	3 5 8 8	13	-Took S-16 at 60'-62'
				62						
				63						-Drill to 65' Drilling: Chatter at 63' Wash: Reddish Brown
	-55.1			64						
				65						-Drilling paused at 64' to core -Recovered ~10" of rock
	-57.1			66						
				67						-Drill to 70' Drilling: Smooth Wash: Reddish Brown
				68						
				69						
				70						

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Log of Boring **LB-8B** Sheet 4 of 4

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 8.9± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-61.1	Reddish Brown coarse to fine SAND, some Gravel, trace Silt (Wet) [Class 3A]		70–72	S-17	SS	0	16 22 19 20	41	-Took S-17 at 70'-72', no recovery, took 3" SS
			72–75						-Drill to 75' Drilling: Chatter and slow Wash: Reddish Brown
-65.1			74						
	(GOOD) 75'-80' Grey SCHIST, coarse to fine Quartz, Mica, Feldspar, slightly weathered, moderate to close fractures, moderate to horizontal dipping, strong [Class 1A]	4:00 6:00 10:00 10:00 10:00	75–80	C-1	NX CORE	REC=58"/60" =97%	RQD=50"/60" =83%		-Core C-1 at 75'-80'
	(GOOD) 80'-85' Grey SCHIST, coarse to fine Quartz, Mica, Feldspar, fresh, moderate to close fractures, moderate to horizontal dipping, strong [Class 1A]	7:00 7:00 6:00 5:00 5:00	80–85	C-2	NX CORE	REC=58"/60" =97%	RQD=53"/60" =88%		-Core C-2 at 80'-85'
-76.1			85						-E.O.B. at 85' 1:00PM 6/28/17 Hole backfilled and grouted
			86–95						

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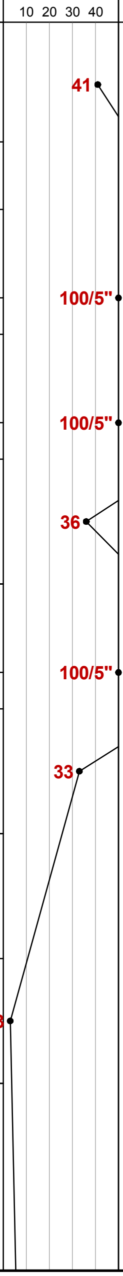
Log of Boring **LB-9** Sheet 1 of 4

Project	76 Varick Street (2 Hudson Square)	Project No.	170470001
Location	New York, New York	Elevation and Datum	El. 9± (NAVD 88) NAVD 88
Drilling Company	Craig Test Boring, Inc.	Date Started / Date Finished	6/19/17 / 6/20/17
Drilling Equipment	Truck Rig	Completion Depth / Rock Depth	79 ft / 69 ft
Size and Type of Bit	2 7/8" Tricone Roller Bit	Number of Samples	Disturbed 17 / Undisturbed - / Core 2
Casing Diameter (in) / Casing Depth (ft)	4" Stainless Steel / 19	Water Level (ft.)	First ▽ - / Completion ▼ - / 24 HR. ▼ -
Casing Hammer / Weight (lbs) / Drop (in)	Automatic / 140 / 30	Drilling Foreman	Dave Cooke
Sampler	2" Split Spoon	Field Engineer	Taylor Adams
Sampler Hammer / Weight (lbs) / Drop (in)	Automatic / 140 / 30		

Elev. (ft) +9.0	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
			0						-Drilling starts at 6/19/17
	Brown coarse to fine SAND, some Brick (Dry) [Class 7]		0–2	S-1	SS	10	6 14 27 100/5"	41	-Took S-1 at 0'-2'
			2–3						-Drilled to 3'
	Brown coarse to fine SAND, some Brick (Dry) [Class 7]		3–5	S-2	SS	16	12 50 100/5"	100/5"	-Obstruction at 2', possible slab or brick -Took S-2 at 3'-5' -Obstruction at 4.5' -Cleared to 5'
	Reddish Brown coarse to fine SAND, some Brick (Moist) [Class 7]		5–7	S-3	SS	12	7 58 100/5"	100/5"	-Took S-3 at 5'-7' -Hammer casing to 4' -Cleared to 7'
	Brown coarse to fine SAND, some Brick (Wet) [Class 7]		7–9	S-4	SS	14	36 25 11 9	36	-Took S-4 at 7'-9'
	Brown coarse to fine SAND, some Brick (Wet) [Class 7]		9–11	S-5	SS	8	8 16 100/5"	100/5"	-Hammer casing to 9' -Cleared to 9' -Took S-5 at 9'-11'
-2.0			11						-Cleared to 11'
	Brown coarse to fine SAND, trace Silt (Wet) [Class 3A] Black coarse to fine SAND, trace Silt (Wet) [Class 3A]		11–13	S-6	SS	20	21 24 9 10	33	-Took S-6A and S-6B at 11'-13'
-5.0			14						-Hammer casing to 14'
	Brown coarse to fine SAND, some Silt (Wet) [Class 6]		15–17	S-7	SS	7	2 1 2 2	3	-Drill to 15' Drilling: Smooth Wash: Brown -Took S-7 at 15'-17'
			19						-Advance casing to 19'
			20						



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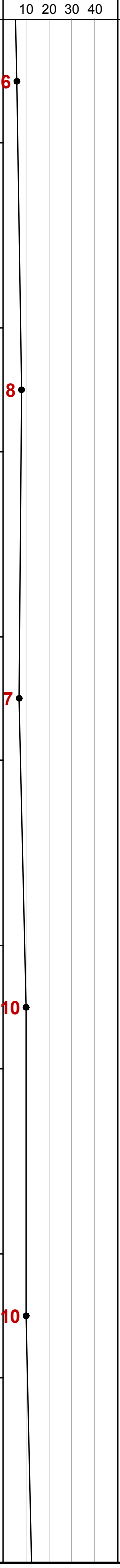
Log of Boring **LB-9** Sheet 2 of 4

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9± (NAVD 88) NAVD 88



MATERIAL SYMBOL	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	-11.0	Brown coarse to fine SAND, some Silt (Wet) [Class 6]		20–22	S-8	SS	12	2 2 4 3	6	-Drill to 20' Drilling: Smooth Wash: Brown -Took S-8 at 20'-22'
				22–25						-Drill to 25' Drilling: Smooth Wash: Brown
		Brown coarse to fine SAND, some Silt (Wet) [Class 6]		25–27	S-9	SS	12	3 3 5 4	8	-Took S-9 at 25'-27'
				27–30						-Drill to 30' Drilling: Smooth Wash: Brown
		Brown medium to fine SAND, some Silt (Wet) [Class 6]		30–32	S-10	SS	20	2 3 4 4	7	-Took S-10 at 30'-32'
	-24.0			32–35						-Drill to 35' Drilling: Smooth Wash: Reddish Brown
		Reddish Brown medium to fine SAND, some Silt (Wet) [Class 3B]		35–37	S-11	SS	12	4 4 6 6	10	-Took S-11 at 35'-37'
				37–40						-Drill to 40' Drilling: Smooth Wash: Reddish Brown
		Reddish Brown medium to fine SAND, some Silt (Wet) [Class 3B]		40–42	S-12	SS	8	3 4 6 6	10	-Took S-12 at 40'-42'
				42–45						-Drill to 45' Drilling: Smooth Wash: Reddish Brown

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Log of Boring **LB-9** Sheet 3 of 4

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-36.0	Reddish Brown medium to fine SAND, some Silt (Wet) [Class 3B]		45–47	S-13	SS	16	3 5 8 13	13	-Took S-14 at 45'-47'
			47–50						-Drill to 50' Drilling: Smooth Wash: Reddish Brown
-40.0	Reddish Brown medium to fine SAND, trace Silt (Wet) [Class 6]		50–52	S-14	SS	14	3 3 5 5	8	-Took S-14 at 50'-52'
			52–55						-Drill to 55' Drilling: Smooth Wash: Reddish Brown
-44.0	Reddish Brown medium to fine SAND, trace Silt (Wet) [Class 3B]		55–57	S-15	SS	16	6 8 9 11	17	-Took S-15 at 55'-57'
			57–60						-Drill to 60' Drilling: Chatter at 59' Wash: Reddish Brown
-50.0			59–60						-Possible obstruction at 59'-60'
-51.0	Reddish Brown coarse to fine SAND, some Silt (Wet) [Class 3B]		60–62	S-16	SS	14	19 18 10 11	28	-Took S-16 at 60'-62'
			62–65						-Drill to 65' Drilling: Slower Wash: Reddish Brown
	Brown coarse to fine SAND, trace Gravel (Wet) [Class 3B]		65–67	S-17	SS	12	13 13 12 10	25	-Took S-17 at 65'-67'
			67–69						-Drill to 69' Drilling: Chatter Wash: Brown
-60.0		3:30	69–70	C-1					

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Log of Boring **LB-9** Sheet 4 of 4

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data Number	Sample Data Type	Sample Data Recov. (in)	Sample Data Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-61.0	(FAIR) 69'-74' Grey SCHIST, coarse to fine grained, moderately weathered to fresh, moderate to close fractures, moderate to horizontal dipping, strong with weak weathered seams [Class 1A]	3:00	70	C-1	NX CORE	REC=52"/60" =87%	RQD=40"/60" =67%		-Core C-1 at 69'-74'
		5:00	71						
		6:30	72						
		6:00	73						
	(EXCELLENT) 74'-79' Grey SCHIST, coarse to fine grained, slightly weathered to fresh, moderate to close fractures, moderate to horizontal dipping, strong [Class 1A]	5:00	74	C-2	NX CORE	REC=58"/60" =97%	RQD=58"/60" =97%		-Core C-2 at 74'-79'
		8:00	75						
		12:00	76						
		8:00	77						
			78						
-70.0			79						-E.O.B. at 79' 6/20/17 Hole grouted and backfilled and covered with hole plug
			80						
			81						
			82						
			83						
			84						
			85						
			86						
			87						
			88						
			89						
			90						
			91						
			92						
			93						
			94						
			95						

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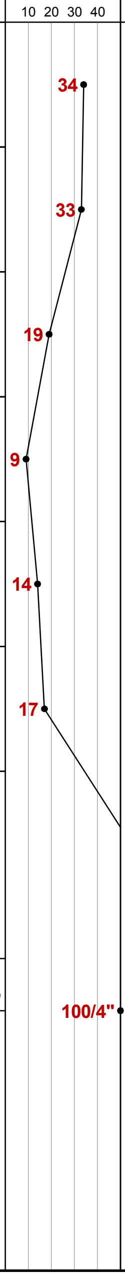
Log of Boring **LB-10** Sheet 1 of 4

Project: 76 Varick Street (2 Hudson Square)	Project No.: 170470001
Location: New York, New York	Elevation and Datum: El. 9± (NAVD 88) NAVD 88
Drilling Company: Craig Test Boring, Inc.	Date Started: 6/26/17 / Date Finished: 6/27/17
Drilling Equipment: Truck Rig	Completion Depth: 90 ft / Rock Depth: 80 ft
Size and Type of Bit: 2 7/8" Tricone Roller Bit	Number of Samples: Disturbed 19 / Undisturbed - / Core 2
Casing Diameter (in): 4" Stainless Steel / Casing Depth (ft): 64	Water Level (ft.): First ▽ - / Completion ▼ - / 24 HR. ▼ -
Casing Hammer: Automatic / Weight (lbs): 140 / Drop (in): 30	Drilling Foreman: Dave Cooke
Sampler: 2" Split Spoon, 3" Split Spoon	
Sampler Hammer: Automatic / Weight (lbs): 140 / Drop (in): 30	Field Engineer: Taylor Adams

Elev. (ft) +9.0	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	Reddish Brown coarse to fine SAND, some Brick (Dry) [Class 7]	0–2	S-1	SS	14	7 14 20 29	34	-Drilling starts at 6/26/17 -Took S-1 at 0'-2'
	Reddish Brown coarse to fine SAND, some Brick (Dry) [Class 7]	2–4	S-2	SS	14	14 15 18 14	33	-Took S-2 at 2'-4'
	Reddish Whitish Brown BRICK, some Concrete, some coarse to fine Sand (Dry) [Class 7]	4–6	S-3	SS	6	5 11 8 8	19	-Hammer casing to 4' -Cleared to 4' -Took S-3 at 4'-6'
	Black coarse to fine SAND, some Concrete (Dry) [Class 7]	6–8	S-4	SS	8	17 5 4 32	9	-Took S-4 at 6'-8'
	Grey coarse to fine SAND, some Gravel, some Brick (Moist) [Class 7]	8–10	S-5	SS	6	10 10 4 3	14	-Hammer casing to 8' -Cleared to 8' -Took S-5 at 8'-10'
	Grey and Red coarse to fine SAND, some Brick, some Gravel (Wet) [Class 7]	10–12	S-6	SS	6	1 6 11 6	17	-Took S-6 at 10'-12'
		12–15						-Push casing to 14' -Drill to 15' Drilling: Light Chatter Wash: Brown
	Black coarse to fine SAND, some Grey Concrete, some Red Brick (Wet) [Class 7]	15–18	S-7	SS	10	40 100/4"	100/4"	-Took S-7 at 15'-17' -Obstruction
-9.0		18–20						-Hammer casing to 19' -Drill to 20' Drilling: Chatter Wash: Light Brown



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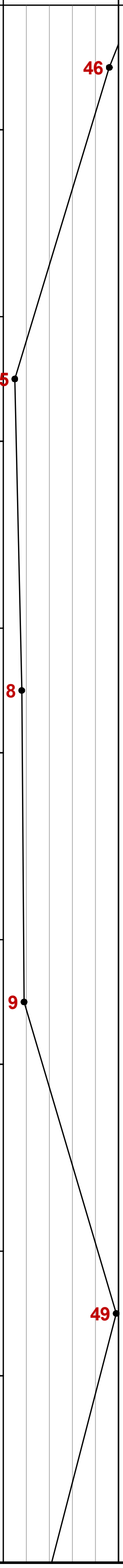
Log of Boring **LB-10** Sheet 2 of 4

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-11.0	Brown, Greenish, and Bluish coarse to fine Sandy GRAVEL (Wet) [Class 2A]		20 – 22	S-8	SS	8	30 30 16 7	46	-Took S-8 at 20'-22'
-13.0			22 – 25						-Hammer casing to 24' -Drill to 25' Drilling: Smooth Wash: Brown
	Reddish Brown medium to fine SAND, some Silt (Wet) [Class 6]		25 – 27	S-9	SS	14	2 3 2 3	5	-Took S-9 at 25'-27'
			27 – 30						-Drill to 30' Drilling: Chatter at 28' Wash: Brown
	Reddish Brown coarse to fine SAND, trace Silt (Wet) [Class 6]		30 – 32	S-10	SS	16	4 3 5 4	8	-Took S-10 at 30'-32' -No recovery for 2" SS, 16" recovery for 3" SS
			32 – 35						-Drill to 35' Drilling: Smooth Wash: Brown
	Reddish Brown coarse to fine SAND, trace Silt (Wet) [Class 6]		35 – 37	S-11	SS	18	4 4 5 5	9	-Took S-11 at 35'-37' -No recovery for 2" SS, 18" recovery for 3" SS
			37 – 40						-Drill to 40' Drilling: Smooth Wash: Brown
-30.0	Reddish Brown medium to fine SAND, some Silt, some Decomposed Rock with Mica (Wet) [Class 3A]		40 – 42	S-12	SS	12	6 19 30 11	49	-Took S-12 at 40'-42'
-35.0			42 – 45						-Drill to 45' Drilling: Smooth Wash: Brown



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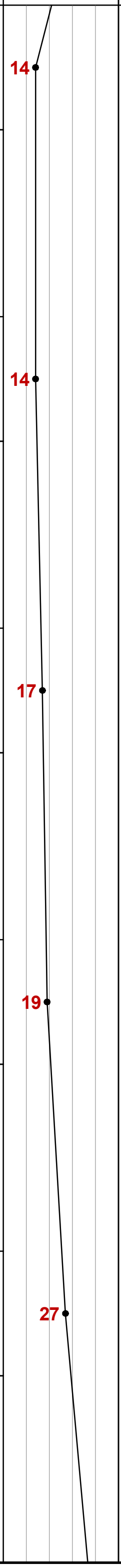
Log of Boring **LB-10** Sheet 3 of 4

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9± (NAVD 88) NAVD 88



Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-36.0	No Recovery		45–47	S-13	SS	0	6 6 8 9	14	-Took S-13 at 45'-47'
			47–50						-Drill to 50' Drilling: Chatter Wash: Brown
	Reddish Brown fine SAND, some Silt (Wet) [Class 3B]		50–52	S-14	SS	16	11 6 8 11	14	-Took S-14 at 50'-52'
			52–55						-Drill to 55' Drilling: Smooth Wash: Brown
	Reddish Brown fine Silty SAND (Wet) [Class 3B]		55–57	S-15	SS	8	5 7 10 9	17	-Took S-15 at 55'-57'
			57–60						-Drill to 60' Drilling: Smooth Wash: Brown
	No Recovery		60–62	S-16	SS	0	6 9 10 11	19	-E.O.D. at 60' at 2:15PM 6/26/17 -B.O.D. at 60' at 7:30AM 6/27/17 -Took S-16 at 60'-62'
			62–65						-Drill to 65' Drilling: Smooth Wash: Brown
	Reddish Brown medium to fine Silty SAND, trace Decomposed Rock (Wet) [Class 3B]		65–67	S-17	SS	12	14 16 11 13	27	-Took S-17 at 65'-67'
-59.0			67–70						-Drill to 70' Drilling: Light Chatter Wash: Brown

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Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9± (NAVD 88) NAVD 88

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-61.0	Reddish Brown coarse to fine Silty SAND, some Decomposed Rock, trace Gravel (Wet) [Class 3A]		70–72	S-18	SS	16	9 22 17 11	39	-Took S-18 at 70'-72'
			72–75						-Drill to 75' Drilling: Smooth Wash: Brown
	No Recovery		75–77	S-19	SS	0	17 18 20 15	38	-Took S-17 at 75'-77'
			77–80						-Hammer casing to 64' -Drill to 80' Drilling: Light Chatter, Rough Chatter at 80' Wash: Brown
-71.0	(GOOD) 80'-85' Grey SCHIST, coarse to fine Mica, Quartz, Feldspar, slightly weathered to fresh, close to wide fractures, shallow dipping, strong [Class 1A]	5:00 5:00 10:00 7:00 8:00	80–85	C-1	NX CORE	REC=56"/60" =93%	RQD=53"/60" =88%		-Core C-1 at 80'-85'
	(EXCELLENT) 85'-90' Grey SCHIST, coarse to fine Mica, Feldspar, Quartz, fresh, wide fractures, steep dipping, very strong [Class 1A]	5:00 7:00 6:00 6:00 6:00	85–90	C-2	NX CORE	REC=60"/60" =100%	RQD=60"/60" =100%		-Core C-2 at 85'-90'
-81.0			90–95						-E.O.B. at 90' 12:00PM 6/27/17 Hole backfilled and covered with hole plug

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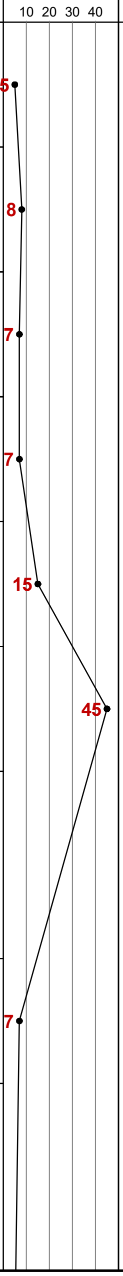
Log of Boring **LB-11** Sheet 1 of 4

Project: 76 Varick Street (2 Hudson Square)	Project No.: 170470001
Location: New York, New York	Elevation and Datum: El. 9.3 ± (NAVD 88)
Drilling Company: Craig Test Boring, Inc.	Date Started: 06/16/2017 — Date Finished: 06/19/2017
Drilling Equipment: Truck Rig	Completion Depth: 81 ft — Rock Depth: 68 ft
Size and Type of Bit: 2 7/8" Tricone Roller Bit	Number of Samples: Disturbed 17 — Undisturbed - — Core 3
Casing Diameter (in): 3" Stainless Steel — Casing Depth (ft): 50	Water Level (ft.): First ▽ - — Completion ▼ - — 24 HR. ▼ 11.1
Casing Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	Drilling Foreman: Dave Cooke
Sampler: 2" Split Spoon	Field Engineer: Taylor Adams
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	



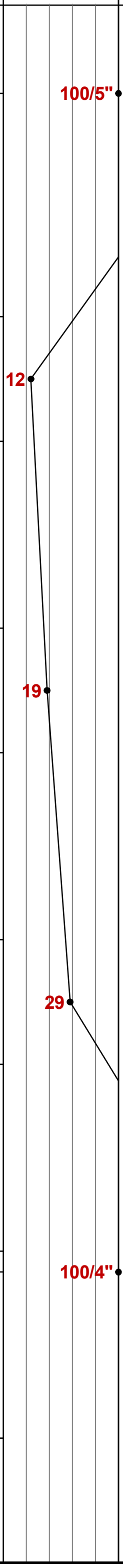
MATERIAL SYMBOL	Elev. (ft) +9.3	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Brown coarse to fine SAND, some Brick, trace Silt (Dry) [Class 7]		0–2	S-1	SS	10	3 3 2 4	5	-Drilling starts at 7:45AM 6/16/17 -Took S-1 at 0'-2'
		Brown coarse to fine SAND, some Brick, some Gravel, trace Silt (Dry) [Class 7]		2–4	S-2	SS	10	4 4 4 7	8	-Took S-2 at 2'-4' -Hammer casing to 4' -Cleared to 4'
		Brown coarse to fine SAND, some Brick, some Gravel, trace Silt (Moist) [Class 7]		4–6	S-3	SS	6	4 4 3 3	7	-Took S-3 at 4'-6'
		Brown GRAVEL, some coarse to fine Sand, some Brick, trace Silt (Wet) [Class 7]		6–8	S-4	SS	6	2 2 5 3	7	-Took S-4 at 6'-8' -Hammer casing to 8' -Cleared to 8'
		Reddish Brown GRAVEL, some Brick, some coarse to fine Sand, trace Silt (Wet) [Class 7]		8–10	S-5	SS	6	7 8 7 8	15	-Took S-5 at 8'-10'
		Black coarse to fine SAND, some Silt (Wet) [Class 7] Grey Black PEAT, some Concrete (Wet) [Class 7]	▼	10–12	S-6	SS	18	11 35 10 6	45	-Took S-6 at 10'-12'
	-3.7			12–15						-Drill to 15' Drilling: Light Chatter Wash: Light Brown, Orangeish Brown at 15'
		Orangeish Brown medium to fine SAND, trace Silt (Wet) [Class 6]		15–17	S-7	SS	8	2 3 4 4	7	-Took S-7 at 15'-17'
				17–20						-Drill to 20' Drilling: Smooth Wash: Orangeish Brown

Project: 76 Varick Street (2 Hudson Square)	Project No.: 170470001
Location: New York, New York	Elevation and Datum: El. 9.3 ± (NAVD 88)

Material Symbol	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	-10.7			20						
		Reddish Brown medium to fine SAND, some Silt (Wet) [Class 6]		20-22	S-8	SS	16	2 2 3 3	5	-Took S-8 at 20'-22'
				22-25						-Drill to 25' Drilling: Smooth Wash: Light Brown
		Reddish Brown medium to fine SAND, some Silt (Wet) [Class 6]		25-27	S-9	SS	14	3 3 4 4	7	-Took S-9 at 25'-27'
				27-30						-Drill to 30' Drilling: Smooth Wash: Reddish Brown
		Reddish Brown Silty SAND (Wet) [Class 6]		30-32	S-10	SS	16	3 3 5 4	8	-Took S-10 at 30'-32'
				32-35						-Drill to 35' Drilling: Smooth Wash: Reddish Brown
		Reddish Brown Silty medium to fine SAND (Wet) [Class 6]		35-37	S-11	SS	14	4 4 5 6	9	-Took S-11 at 35'-37'
				37-40						-Drill to 40' Drilling: Smooth Wash: Reddish Brown
		Reddish Brown Silty medium to fine SAND (Wet) [Class 6]		40-42	S-12	SS	14	3 4 5 5	9	-Took S-12 at 40'-42'
				42-45						-Drill to 45' Drilling: Smooth Wash: Reddish Brown
	-34.7			44						
				45						

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9.3 ± (NAVD 88)

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
-35.7	Reddish Brown Silty medium to fine SAND (Wet) [Class 3A]		45	S-13	SS	12	4 18 100/5"	100/5"	-Took S-13 at 45'-47'
-38.7			48						-Drill to 50' Drilling: Heavy Chatter Wash: Brown -Potential Boulder
-40.2	Reddish Brown coarse to fine SAND, some Gravel, trace Silt (Wet) [Class 3B]		50	S-14	SS	16	12 4 8 8	12	-Took S-14 at 50'-52'
			52						-Drill to 55' Drilling: Chatter Wash: Reddish Brown
	Reddish Brown fine Silty SAND (Wet) [Class 3B]		55	S-15	SS	16	7 11 8 11	19	-Took S-15 at 55'-57'
			57						-Drill to 60' Drilling: Smooth Wash: Reddish Brown
	Reddish Brown medium to fine SAND, trace Silt (Wet) [Class 3B]		60	S-16	SS	18	8 13 16 14	29	-Took S-16 at 60'-62'
			62						-Drill to 65' Drilling: Smooth Wash: Reddish Brown
	No Recovery		65	S-17	SS	0	100/4"	100/4"	-Took S-17 at 65'-67'
			66						-Drill to 68' Drilling: Slow and Rough Wash: Reddish Brown
-58.7		3:00 2:30	68	C-1	NX CORE				-Core C-1 at 68'-73'
			70						



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Log of Boring **LB-11** Sheet 4 of 4

Project 76 Varick Street (2 Hudson Square)	Project No. 170470001
Location New York, New York	Elevation and Datum El. 9.3 ± (NAVD 88)

Elev. (ft)	Sample Description	Depth Scale	Sample Data Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40
-60.7	(POOR) 68'-73' Grey SCHIST, coarse to fine grained Quartz, Feldspar, Mica, slightly weathered, moderate to close fractures, steep to near horizontal dipping, strong [Class 1]	70–73	C-1	NX CORE	REC=28"/60" =47%	RQD=15"/60" =25%	
	(FAIR) 73'-76' Grey SCHIST, coarse to fine grained Quartz, Feldspar, Mica, slightly weathered, moderate to close fractures, steep dipping, strong [Class 1]	73–76	C-2	NX CORE	REC=47%	RQD=36%	
-71.7	(GOOD) 76'-81' Grey SCHIST, coarse to fine grained Quartz, Feldspar, Mica, slightly weathered, moderate to close fractures, shallow dipping, strong [Class 1]	76–81	C-3	NX CORE	REC=52"/60" =87%	RQD=45"/60" =75%	

Depth	Coring (min)
70–71	1:30
71–72	5:00
72–73	2:30
73–74	5:00
74–75	3:00
75–76	3:00
76–77	2:00
77–78	2:00
78–79	3:02
79–80	4:00
80–81	4:00

Depth Scale: 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95

Remarks
(Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)

-At 71.5' barrel plugged, retract stem, resume coring after sample taken

-Core barrel empty after drilling to 73' and retracted

-Core C-2 at 73'-76'

-Core to 76'

-Core C-3 at 76', empty barrel

-Advanced casing to 30'

-E.O.D.

-B.O.D. 6/19/17

-Advance casing to 50'

-Drilled out hole with 3 1/4" roller bit to 76'

-Core at 76', core barrel repair

-C-1 and C-2 probable small REC and RQD due to faulty core barrel

-E.O.B. at 81' 6/19/17
Hole backfilled and grouted

ATTACHMENT B

2017 SCPT Probe Boring Logs

PRESENTATION OF SITE INVESTIGATION RESULTS

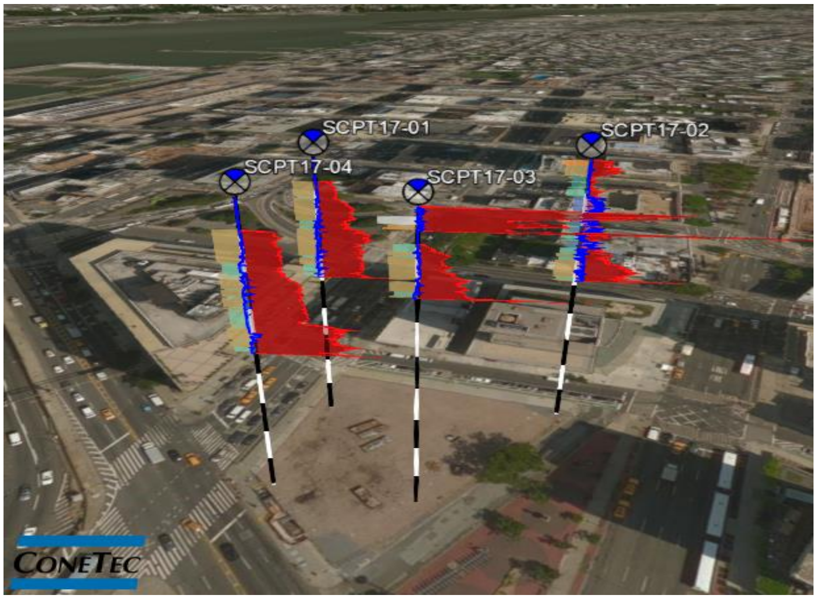
76 Varick Street
Manhattan, New York

Prepared for:

Langan Engineering

ConeTec Job No: 17-53134

Project Start Date: 17-Oct-2017
Project End Date: 18-Oct-2017
Report Date: 20-Oct-2017



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www.conetecdataservices.com

Introduction

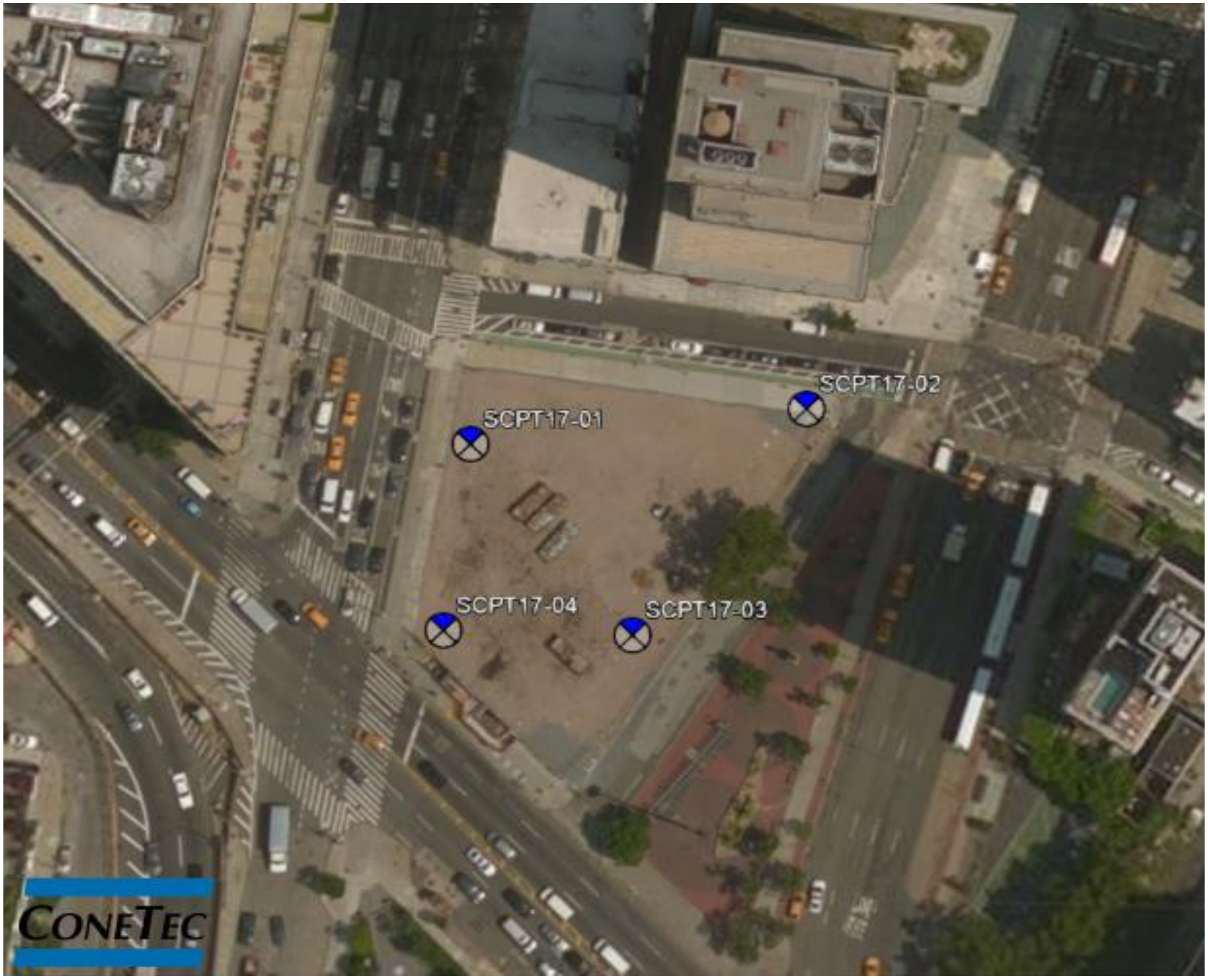
The enclosed report presents the results of a seismic piezocone penetration testing (SCPTu or SCPT) program carried out at the 76 Varick Street site located in Manhattan, New York. The site investigation program was conducted by ConeTec Inc. (ConeTec), under contract to Langan Engineering (Langan) of New York, New York.

A total of 4 seismic cone penetration tests were completed at 4 locations. The SCPT program was performed to evaluate the subsurface soil conditions. SCPT sounding locations were selected and numbered under supervision of Langan personnel (Ms. Martha Glykofrid-Fragkou).

Project Information

Project	
Client	Langan Engineering
Project	76 Varick St., Manhattan, NY
ConeTec project number	17-53134

A map from CESIUM including the CPT test locations is presented below.



Rig Description	Deployment System	Test Type
CPT Truck Rig	25 ton truck mounted (twin cylinders)	SCPT

Coordinates		
Test Type	Collection Method	EPSG Number
SCPT	GPS (GlobalSat MR-350)	32618 (WGS 84 / UTM North)

Cone Penetration Test (CPT)	
Depth reference	Ground surface at the time of the investigation.
Tip and sleeve data offset	0.1 meter. This has been accounted for in the CPT data files.
Pore pressure dissipation (PPD) tests	Six pore pressure dissipation tests were completed primarily to determine the phreatic surface.
Additional Comments	Shear wave velocity tests were conducted at one meter depth intervals at all locations.

Cone Description	Cone Number	Cross Sectional Area (cm^2)	Sleeve Area (cm^2)	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (psi)
495:T1500F15U500	495	15	225	1500	15	500

Limitations

This report has been prepared for the exclusive use of Langan Engineering (Client) for the project titled “76 Varick St., Manhattan, NY”. The report’s contents may not be relied upon by any other party without the express written permission of ConeTec. ConeTec has provided site investigation services, prepared the factual data reporting, and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.

The cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd. of Richmond, British Columbia, Canada.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm^2 and 15 cm^2 tip base area configurations in order to maximize signal resolution for various soil conditions. The 15 cm^2 penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm^2 piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u_2" position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meet or exceed those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

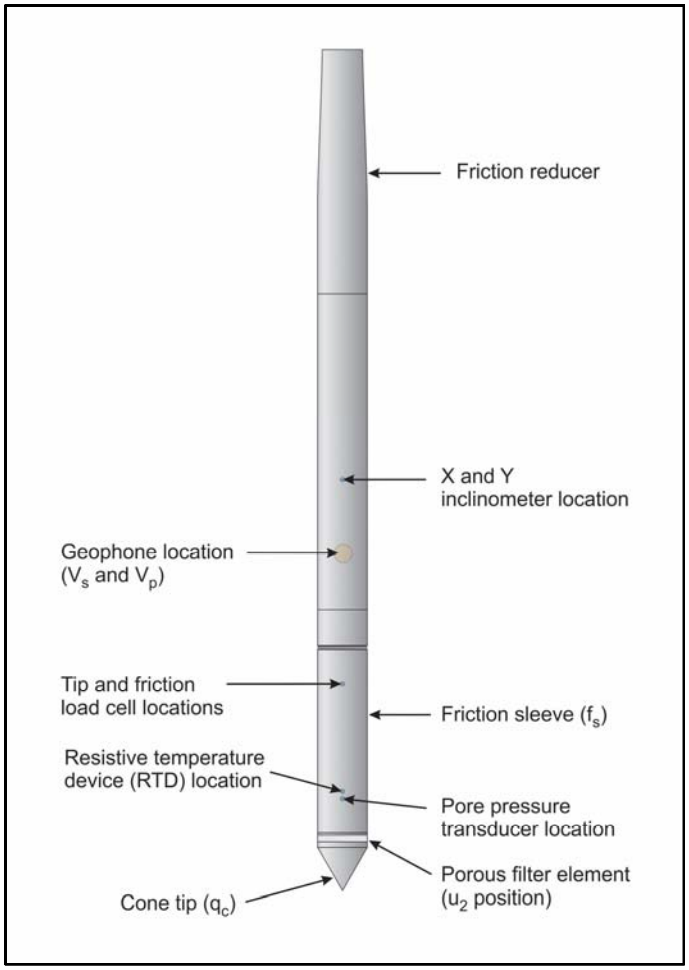


Figure CPTu. Piezocone Penetrometer (15 cm^2)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording intervals are either 2.5 cm or 5.0 cm depending on project requirements; custom recording intervals are possible. The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerin or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil or glycerin under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al, 1986:

$$q_t = q_c + (1\text{-}a) \bullet u_2$$

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is included in an appendix.

For additional information on CPTu interpretations, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

References

ASTM D5778-12, 2012, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM, West Conshohocken, US.

Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, “Cone Penetration Testing in Geotechnical Practice”, Blackie Academic and Professional.

Mayne, P.W., 2013, “Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests”, Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420.

Mayne, P.W. and Peuchen, J., 2012, “Unit weight trends with cone resistance in soft to firm clays”, Geotechnical and Geophysical Site Characterization *4,* Vol. 1 (Proc. ISC-4, Pernambuco), CRC Press, London: 903-910.

Mayne, P.W., 2014, “Interpretation of geotechnical parameters from seismic piezocone tests”, CPT’14 Keynote Address, Las Vegas, NV, May 2014.

Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, “Use of Piezometer Cone Data”, Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.

Robertson, P.K., 1990, “Soil Classification Using the Cone Penetration Test”, Canadian Geotechnical Journal, Volume 27: 151-158.

Robertson, P.K., 2009, “Interpretation of cone penetration tests – a unified approach”, Canadian Geotechnical Journal, Volume 46: 1337-1355.

Shear wave velocity testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave (Vp) velocity is also determined.

ConeTec's piezocone penetrometers are manufactured with a horizontally active geophone (28 hertz) that is rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances an auger source or an imbedded impulsive source maybe used for both shear waves and compression waves. The hammer and beam act as a contact trigger that triggers the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded using an up-hole integrated digital oscilloscope which is part of the SCPTu data acquisition system. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

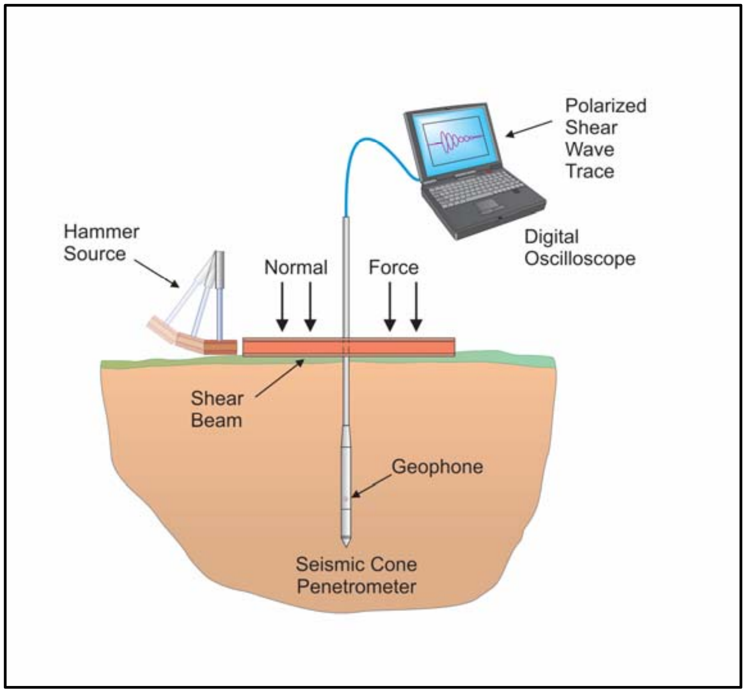


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Multiple wave traces are recorded for quality control purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et.al. (1986).

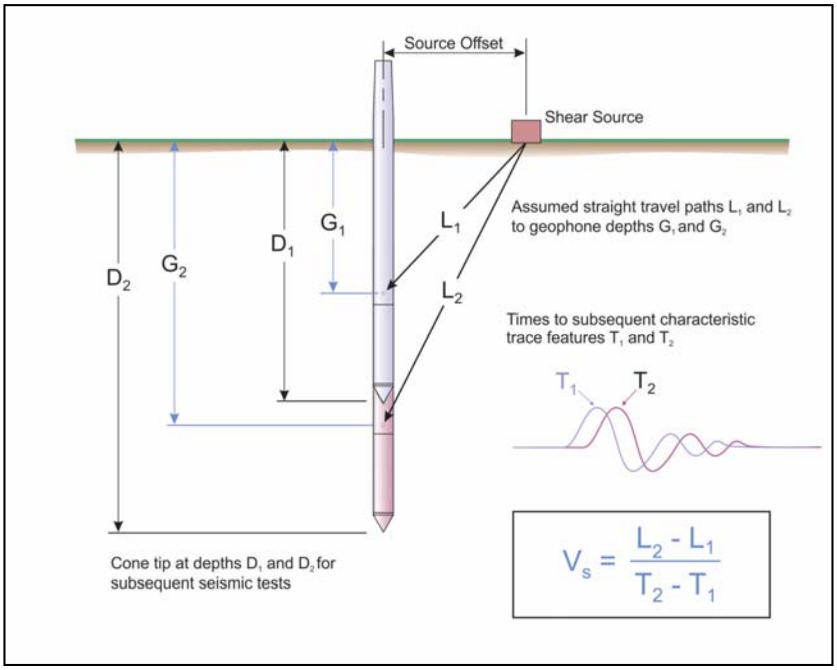

Source Offset
Shear Source
Assumed straight travel paths L1 and L2 to geophone depths G1 and G2
L1
L2
G1
D1
G2
D2
Times to subsequent characteristic trace features T1 and T2
T1
T2
Cone tip at depths D1 and D2 for subsequent seismic tests
Vs = (L2 - L1) / (T2 - T1)

Figure SCPTu-2. Illustration of a seismic cone penetration test

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

The average shear wave velocity to a depth of 100 feet (30 meters) ($\bar{v}_s$) has been calculated and provided for all applicable soundings using the following equation presented in ASCE, 2010.

$$\bar{v}_s = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}}$$

where: $\bar{v}_s$ = average shear wave velocity ft/s (m/s)
d_i = the thickness of any layer between 0 and 100 ft (30 m)
v_{si} = the shear wave velocity in ft/s (m/s)
$\sum_{i=1}^{n} d_i$ = 100 ft (30 m)

Average shear wave velocity, $\bar{v}_s$ is also referenced to V_{s100} or V_{s30}.

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

Tabular results and SCPTu plots are presented in the relevant appendix.

References

American Society of Civil Engineers (ASCE), 2010, “Minimum Design Loads for Buildings and Other Structures”, Standard ASCE/SEI 7-10, American Society of Civil Engineers, ISBN 978-0-7844-1085-1, Reston, Virginia.

Robertson, P.K., Campanella, R.G., Gillespie D and Rice, A., 1986, “Seismic CPT to Measure In-Situ Shear Wave Velocity”, Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8: 791-803.

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

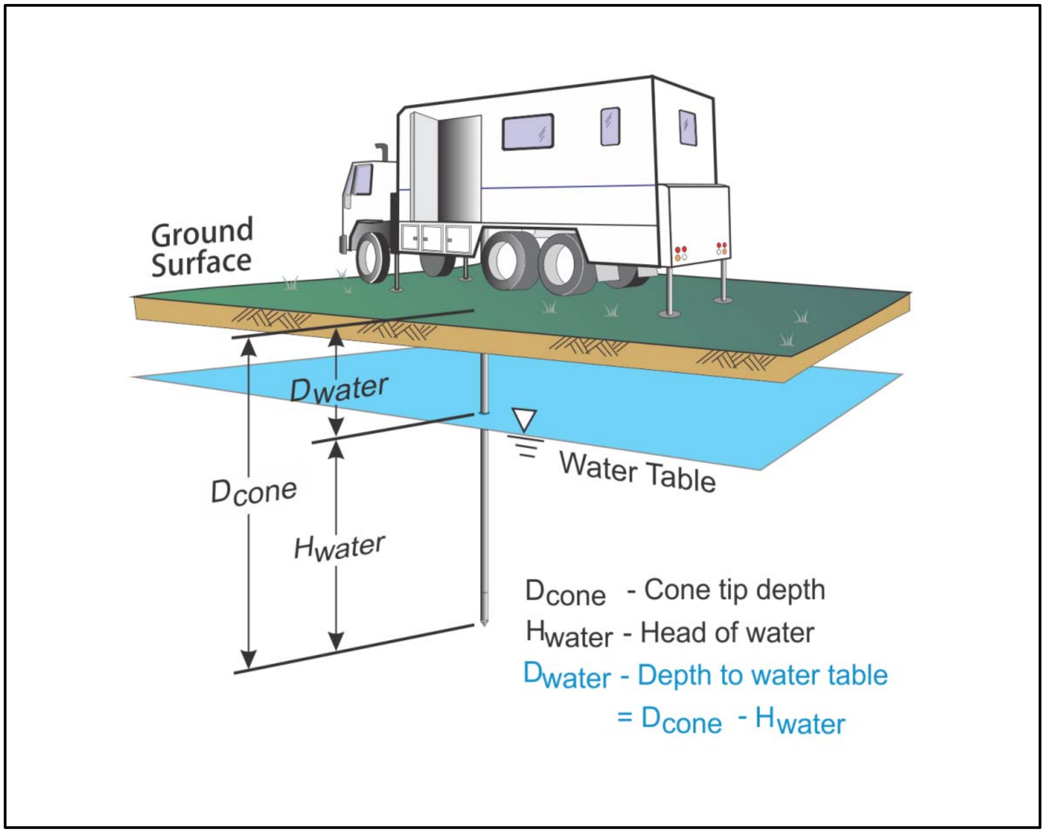


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

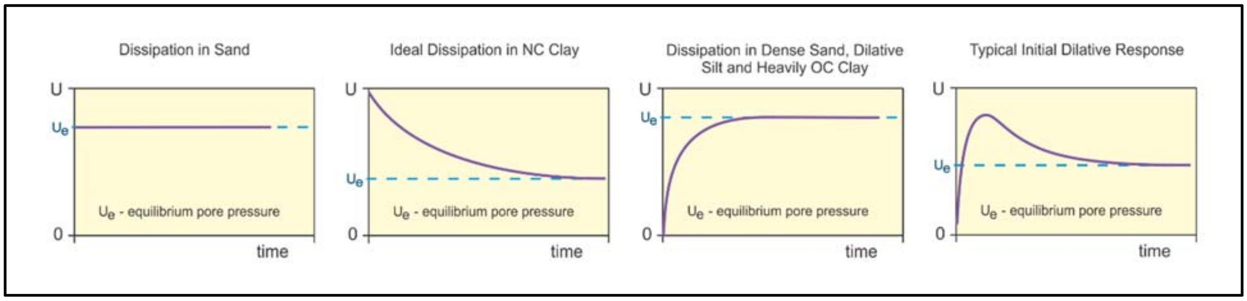


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve of Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as t_{100}. In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to t_{100}. A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T*) may be used to calculate the coefficient of consolidation (c_h) at various degrees of dissipation resulting in the expression for c_h shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

T* is the dimensionless time factor (Table Time Factor)

a is the radius of the cone

I_r is the rigidity index

t is the time at the degree of consolidation

Table Time Factor. T* versus degree of dissipation (Teh and Houlsby, 1991)

Degree of Dissipation (%)	20	30	40	50	60	70	80
T* (u_2)	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time (t_{50}) corresponding to a degree of dissipation of 50% (u_{50}). In order to determine t_{50}, dissipation tests must be taken to a pressure less than u_{50}. The u_{50} value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as u_{100}. To estimate u_{50}, both the initial maximum pore pressure and u_{100} must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at t_{100}) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly (u_{100}), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of c_h (Teh and Houlsby, 1991), t_{50} values are estimated from the corresponding pore pressure dissipation curve and a rigidity index (I_r) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining t_{50}. In cases where the time to peak is excessive, t_{50} values are not calculated.

Due to possible inherent uncertainties in estimating I_r, the equilibrium pore pressure and the effect of an initial dilatory response on calculating t_{50}, other methods should be applied to confirm the results for c_h.

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

References

Burns, S.E. and Mayne, P.W., 1998, “Monotonic and dilatory pore pressure decay during piezocone tests”, Canadian Geotechnical Journal 26 (4): 1063-1073.

Burns, S.E. and Mayne, P.W., 2002, “Analytical cavity expansion-critical state model cone dissipation in fine-grained soils”, Soils & Foundations, Vol. 42(2): 131-137.

Jones, G.A. and Van Zyl, D.J.A., 1981, “The piezometer probe: a useful investigation tool”, Proceedings, 10th International Conference on Soil Mechanics and Foundation Engineering, Vol. 3, Stockholm: 489-495.

Robertson, P.K., Sully, J.P., Woeller, D.J., Lunne, T., Powell, J.J.M. and Gillespie, D.G., 1992, “Estimating coefficient of consolidation from piezocone tests”, Canadian Geotechnical Journal, 29(4): 551-557.

Sully, J.P., Robertson, P.K., Campanella, R.G. and Woeller, D.J., 1999, “An approach to evaluation of field CPTU dissipation data in overconsolidated fine-grained soils”, Canadian Geotechnical Journal, 36(2): 369-381.

Teh, C.I., and Houlsby, G.T., 1991, “An analytical study of the cone penetration test in clay”, Geotechnique, 41(1): 17-34.

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Normalized Cone Penetration Test Plots
- Seismic Cone Penetration Test Plots
- Seismic Cone Penetration Test Tabular Results
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

Cone Penetration Test Summary and

Standard Cone Penetration Test Plots

CONETEC

Job No: 17-53131
Client: Langan Engineering
Project: 76 Varick St., Manhattan, NY
Start Date: 17-Oct-2017
End Date: 18-Oct-2017

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Shear Wave Velocity Tests	Northing[2] (m)	Easting (m)	Refer to Notation Number
SCPT17-01	17-53134_SP01	17-Oct-2017	495:T1500F15U500	11.1	63.16	8	4508469	583943	
SCPT17-02	17-53134_SP02	18-Oct-2017	495:T1500F15U500	11.7	62.83	15	4508481	583995	
SCPT17-03	17-53134_SP03	18-Oct-2017	495:T1500F15U500	10.2	38.06	8	4508440	583969	
SCPT17-04	17-53134_SP04	18-Oct-2017	495:T1500F15U500	11.6	71.19	12	4508439	583941	
Totals	4 soundings				235.23	43			

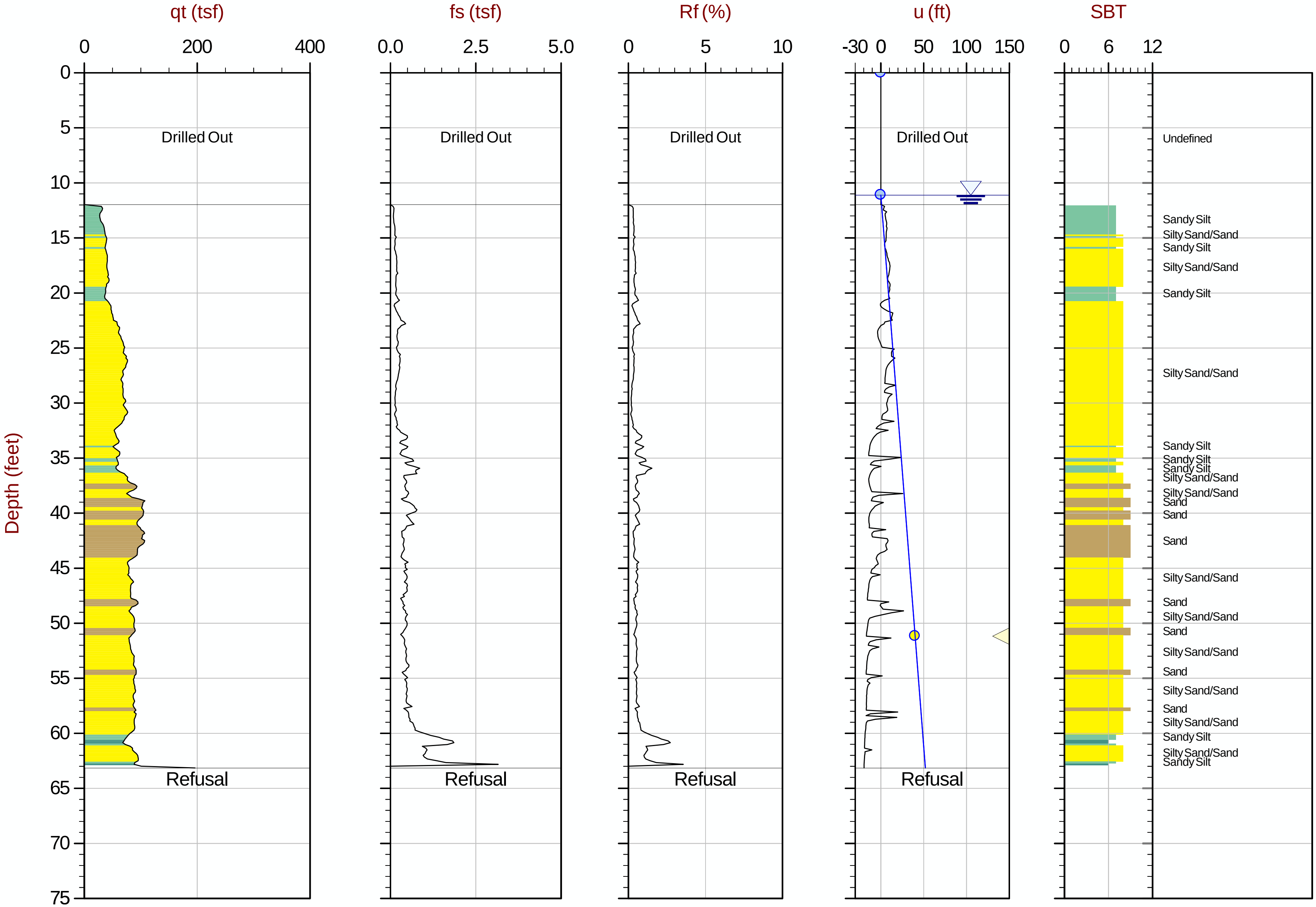
1. Assumed phreatic surface depths were determined from the pore pressure data unless otherwise noted. Hydrostatic data were used for calculated parameters.
2. Coordinates are WGS 84 / UTM Zone 18 and were collected using a MR-350 GlobalSat GPS Receiver.
3. Assumed phreatic surface estimated from the dynamic pore pressure response.
4. No phreatic surface detected

CONETEC

Langan Engineering

Job No: 17-53134
Date: 2017-10-17 09:10
Site: 76 Varick Street, Manhattan, NY

Sounding: SCPT17-01
Cone: 495:T1500F15U500



Max Depth: 19.250 m / 63.16 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53134_SP01.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4508469m E: 583943m

— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

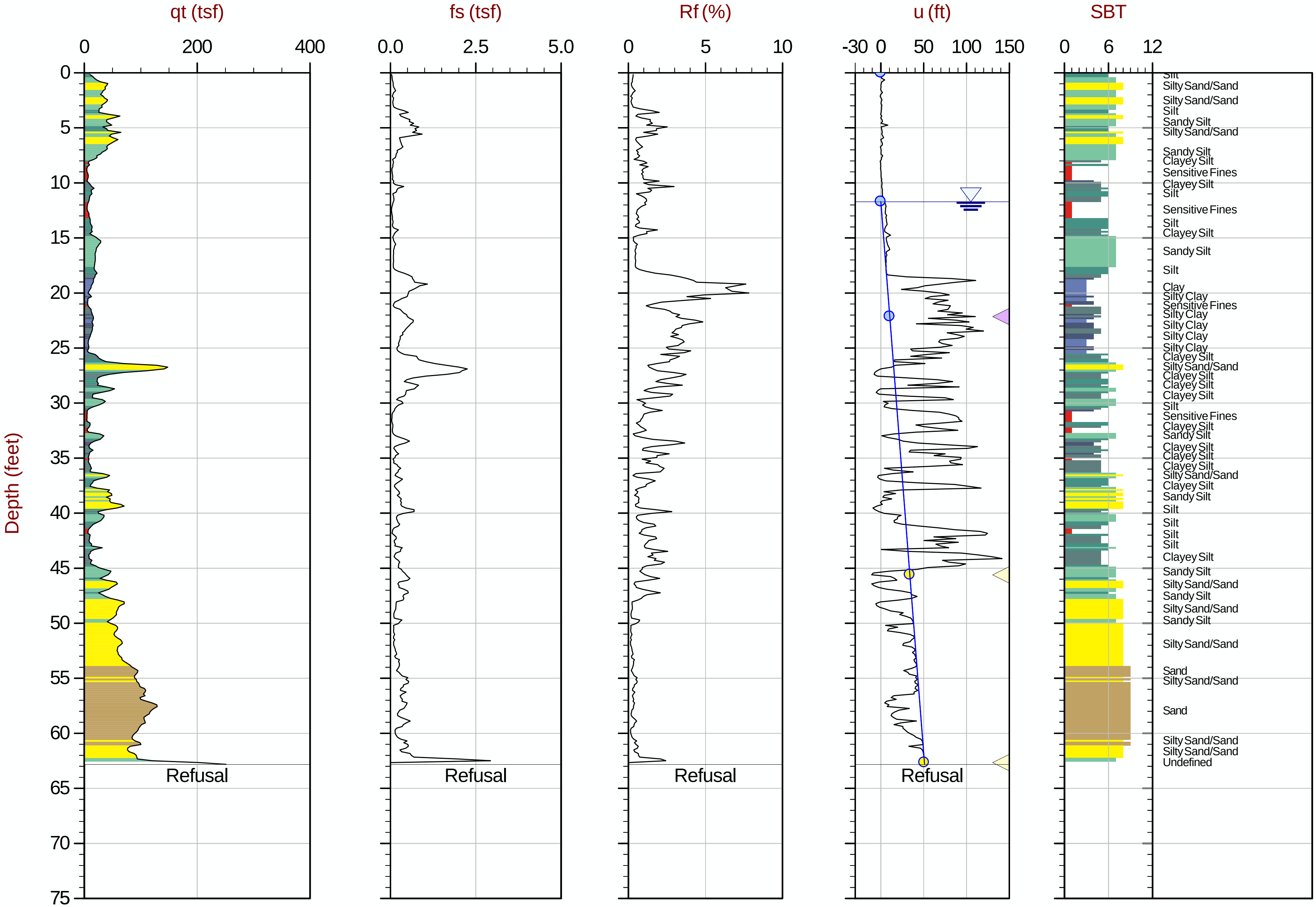
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Langan Engineering

Job No: 17-53134
Date: 2017-10-18 09:03
Site: 76 Varick Street, Manhattan, NY

Sounding: SCPT17-02
Cone: 495:T1500F15U500



Max Depth: 19.150 m / 62.83 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53134_SP02.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4508477m E: 583994m

— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

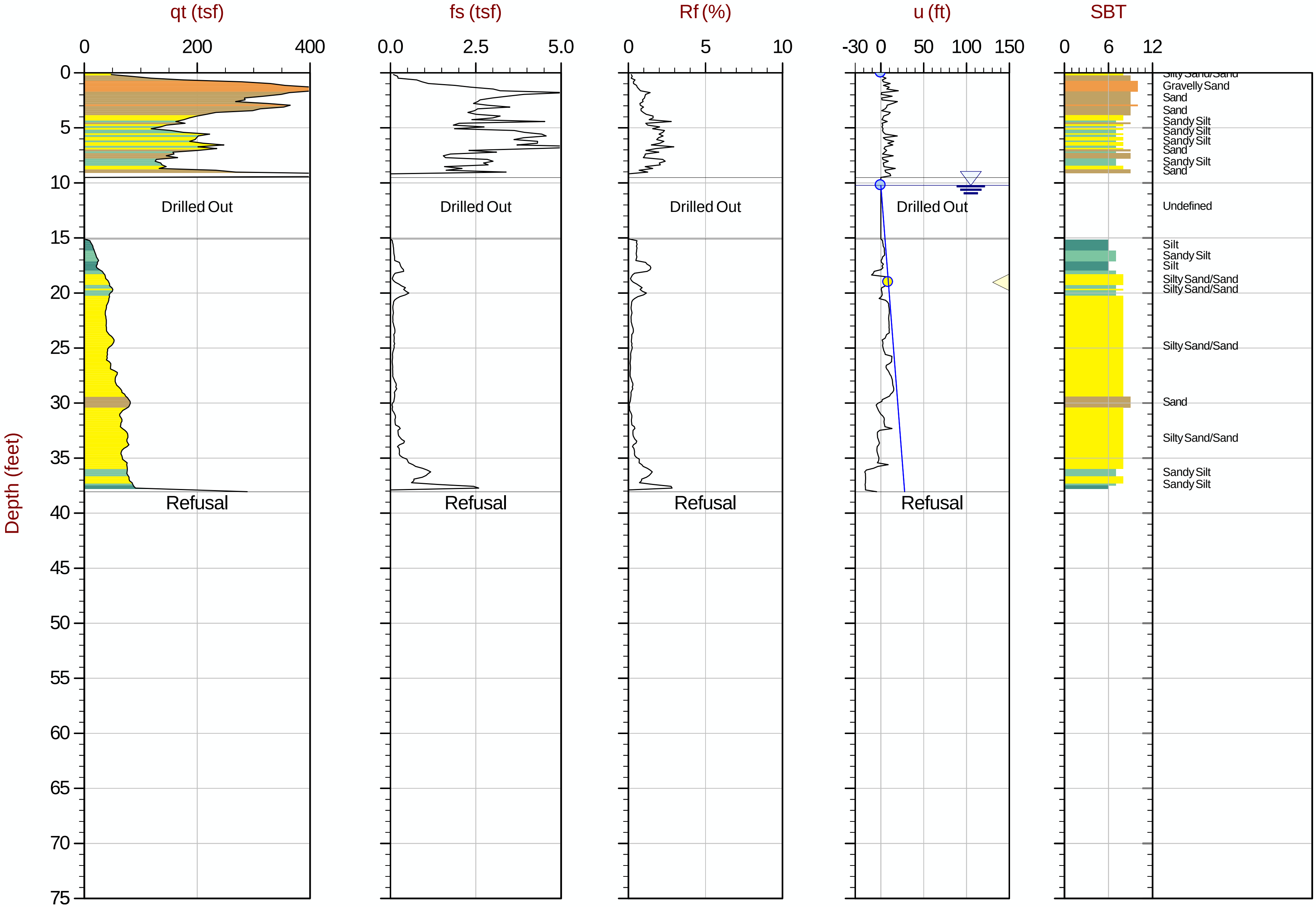
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Langan Engineering

Job No: 17-53134
Date: 2017-10-18 12:02
Site: 76 Varick Street, Manhattan, NY

Sounding: SCPT17-03
Cone: 495:T1500F15U500



Max Depth: 11.600 m / 38.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53134_SP03.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4508440m E: 583969m

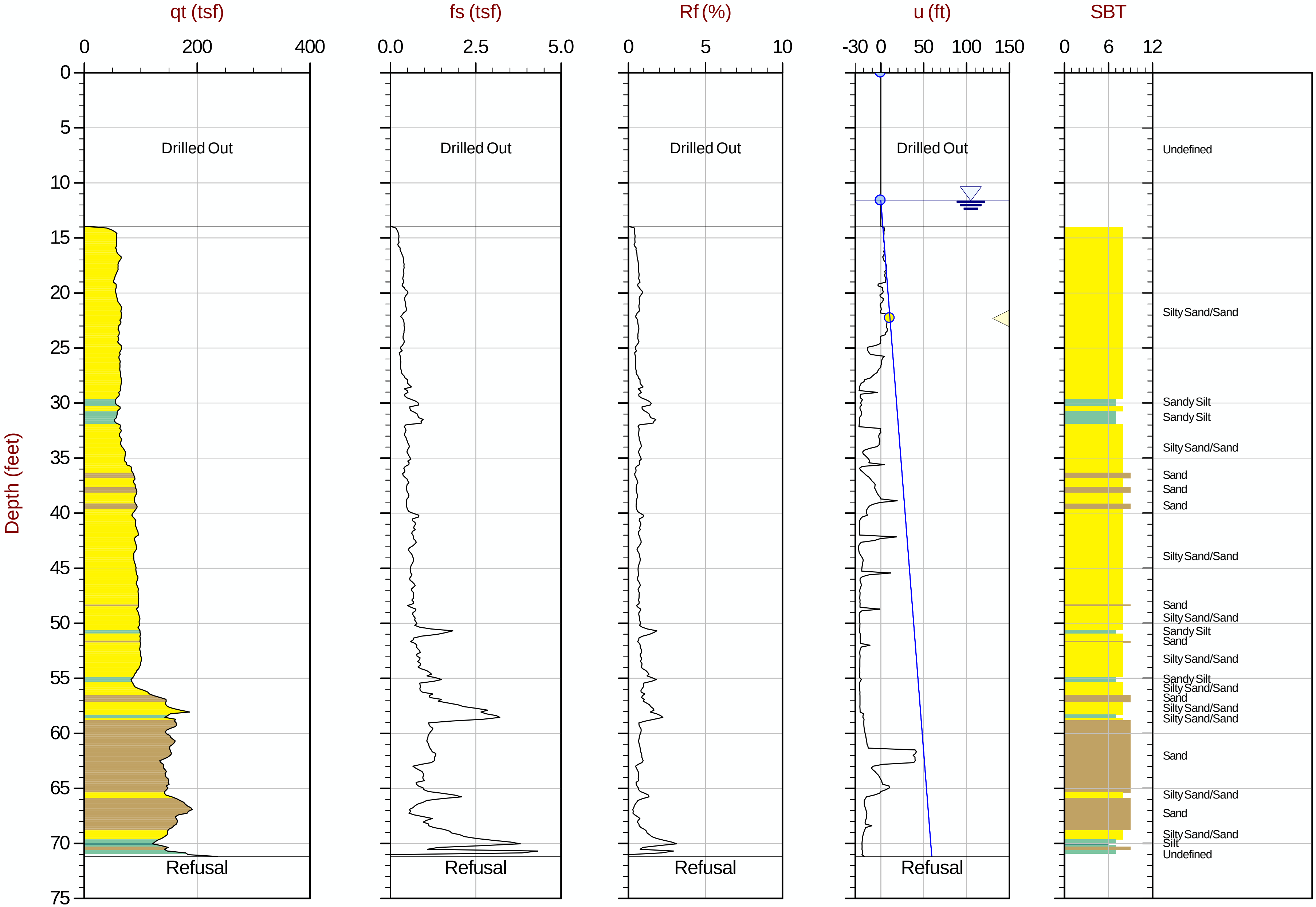
— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Langan Engineering

Job No: 17-53134
Date: 2017-10-18 13:20
Site: 76 Varick Street, Manhattan, NY

Sounding: SCPT17-04
Cone: 495:T1500F15U500



Max Depth: 21.700 m / 71.19 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53134_SP04.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4508439m E: 583941m

— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

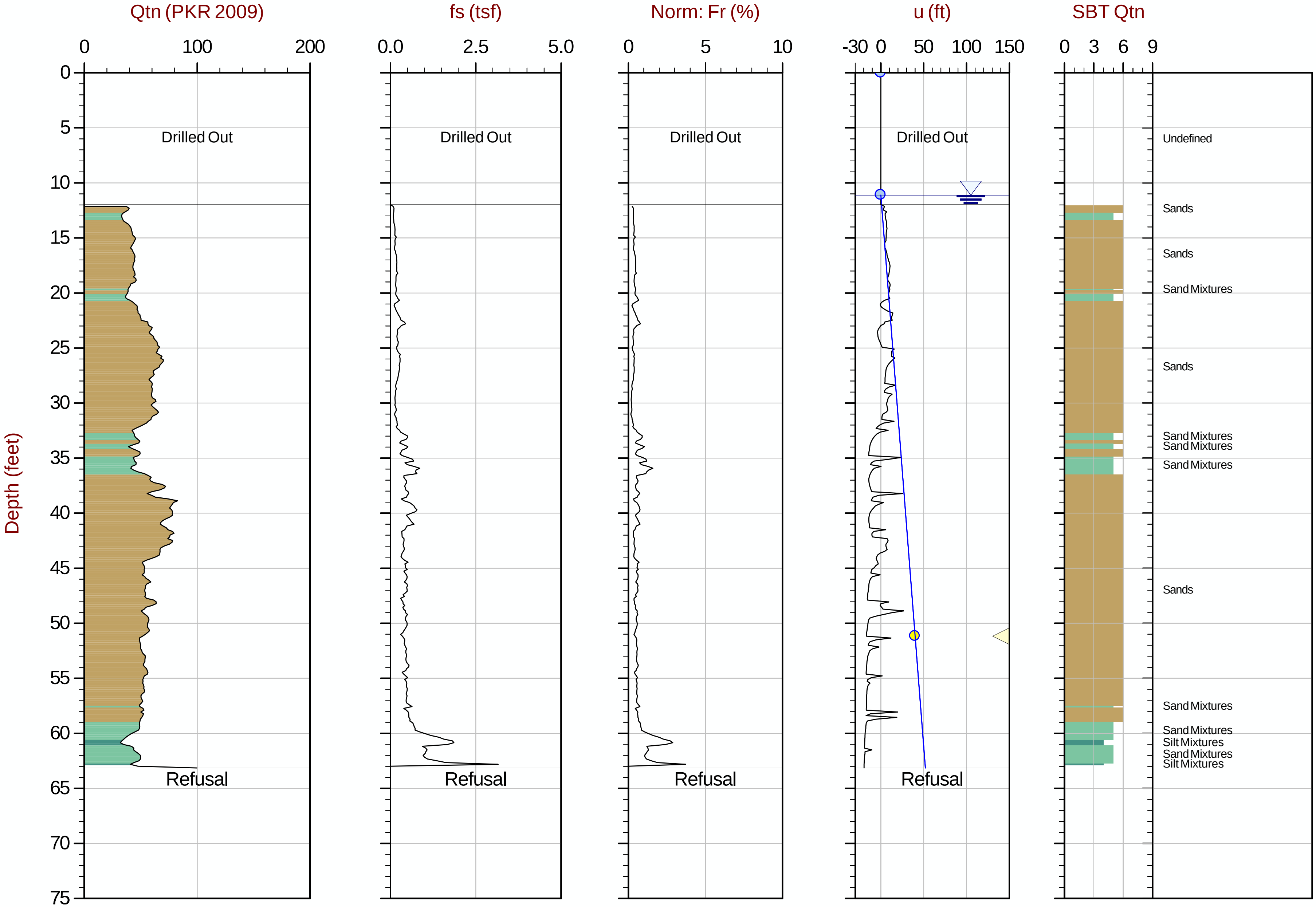
Normalized Cone Penetration Test Plots

CONETEC

Langan Engineering

Job No: 17-53134
Date: 2017-10-17 09:10
Site: 76 Varick Street, Manhattan, NY

Sounding: SCPT17-01
Cone: 495:T1500F15U500



Max Depth: 19.250 m / 63.16 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53134_SP01.COR

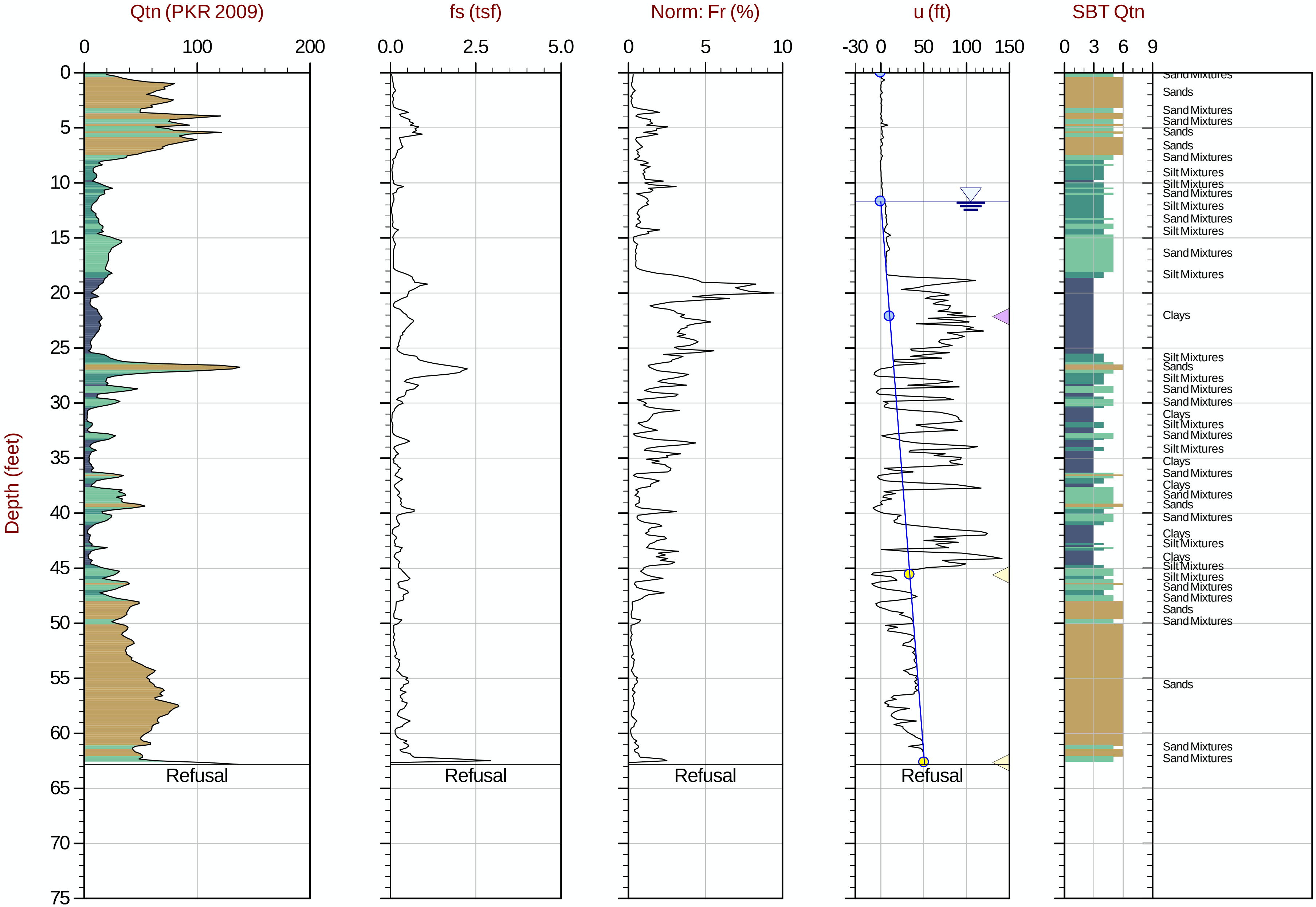
SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4508469m E: 583943m

— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Langan Engineering

Job No: 17-53134
Date: 2017-10-18 09:03
Site: 76 Varick Street, Manhattan, NY
Sounding: SCPT17-02
Cone: 495:T1500F15U500



Max Depth: 19.150 m / 62.83 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53134_SP02.COR

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4508477m E: 583994m

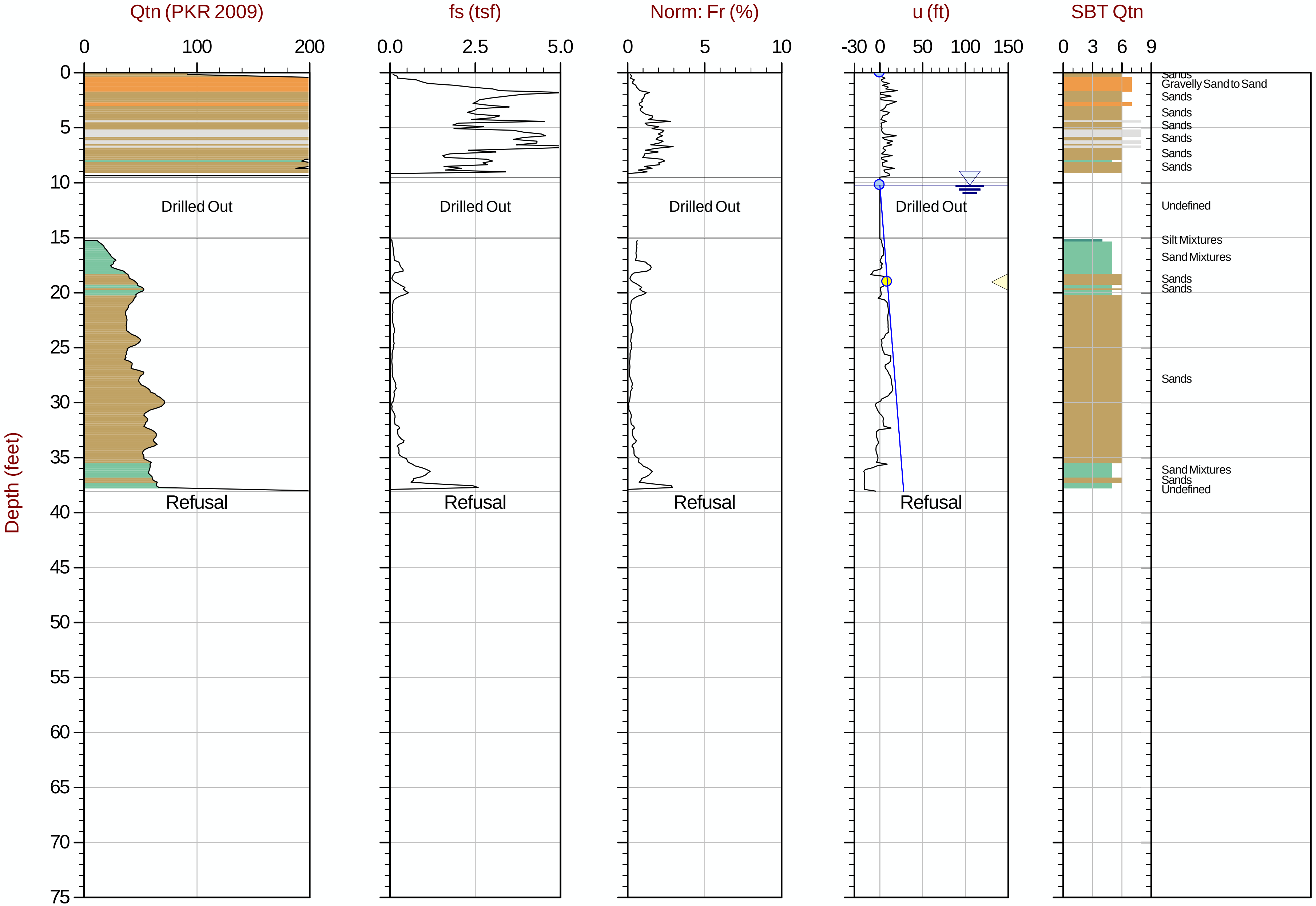
— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Langan Engineering

Job No: 17-53134
Date: 2017-10-18 12:02
Site: 76 Varick Street, Manhattan, NY
Sounding: SCPT17-03
Cone: 495:T1500F15U500



Max Depth: 11.600 m / 38.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53134_SP03.COR

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4508440m E: 583969m

— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

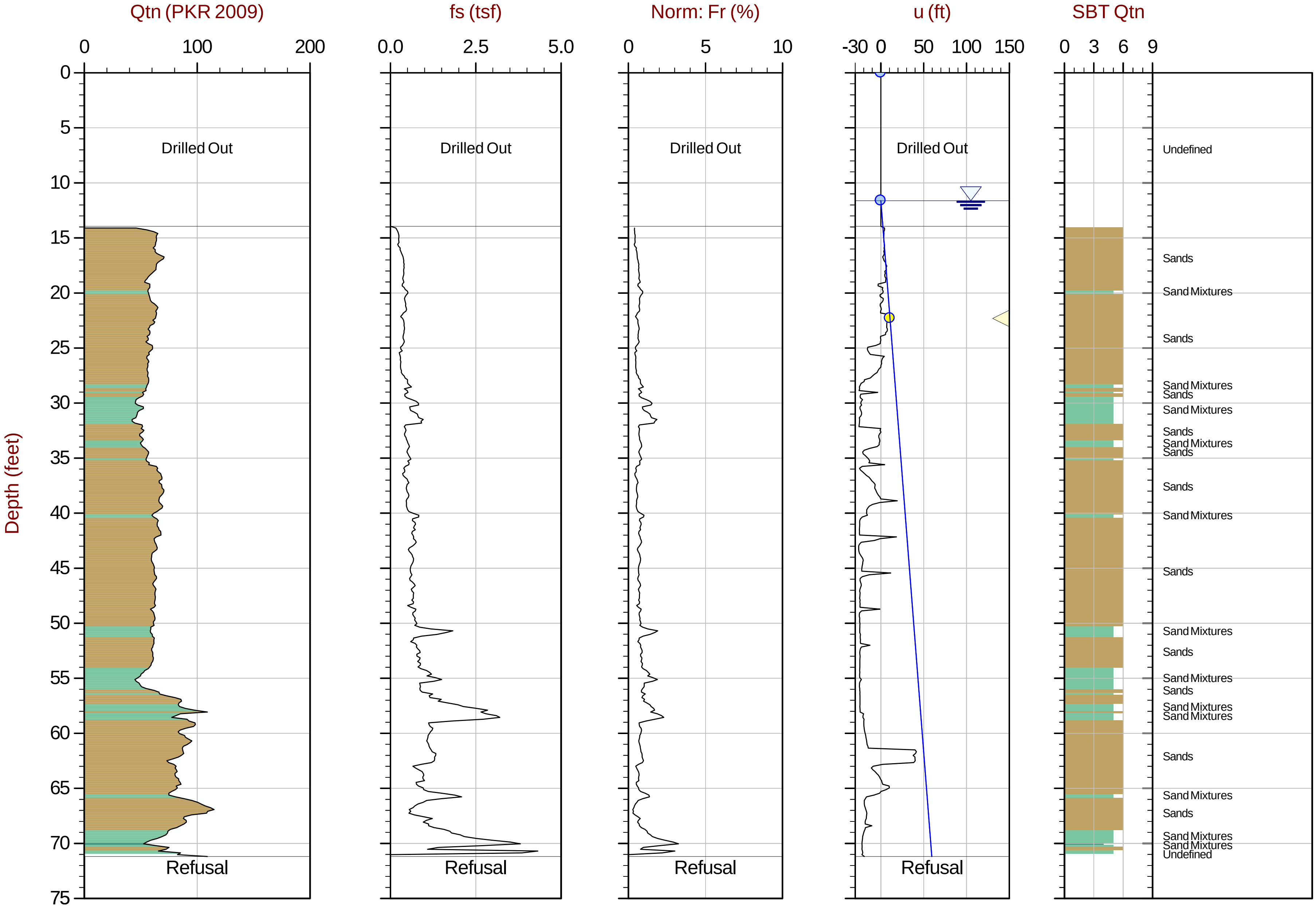
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Langan Engineering

Job No: 17-53134
Date: 2017-10-18 13:20
Site: 76 Varick Street, Manhattan, NY

Sounding: SCPT17-04
Cone: 495:T1500F15U500



Max Depth: 21.700 m / 71.19 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53134_SP04.COR

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4508439m E: 583941m

— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

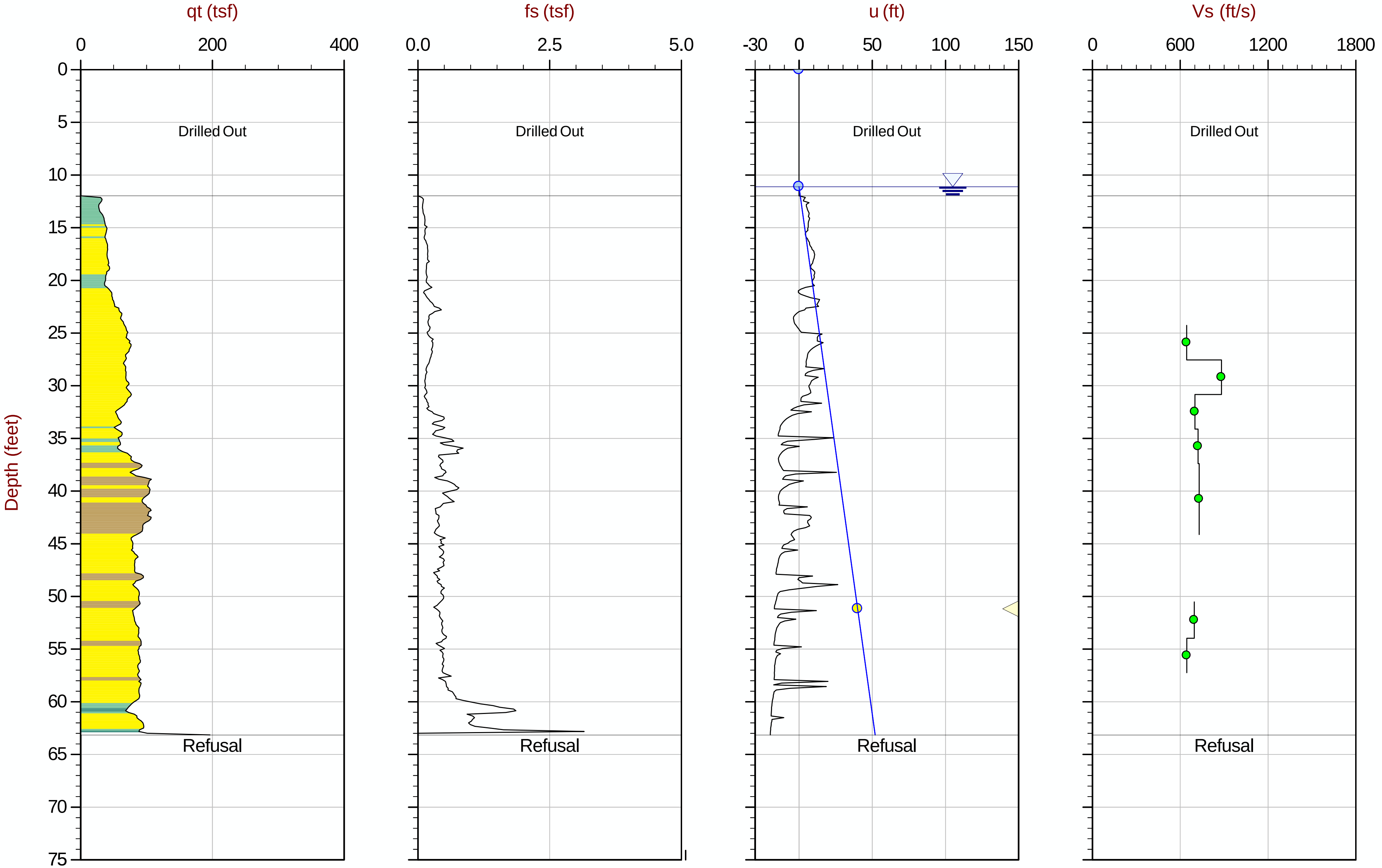
Seismic Cone Penetration Test Plots

CONETEC

Langan Engineering

Job No: 17-53134
Date: 2017-10-17 09:10
Site: 76 Varick Street, Manhattan, NY

Sounding: SCPT17-01
Cone: 495:T1500F15U500



Max Depth: 19.250 m / 63.16 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53134_SP01.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4508469m E: 583943m

Hydrostatic Line ○ Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Job No: 17-53134
Client: Langan Engineering
Project: 76 Varick St., Manhattan, NY
Sounding ID: SCPT17-02
Date: 18-Oct-2017

Seismic Source: Beam
Source Offset (ft): 1.97
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

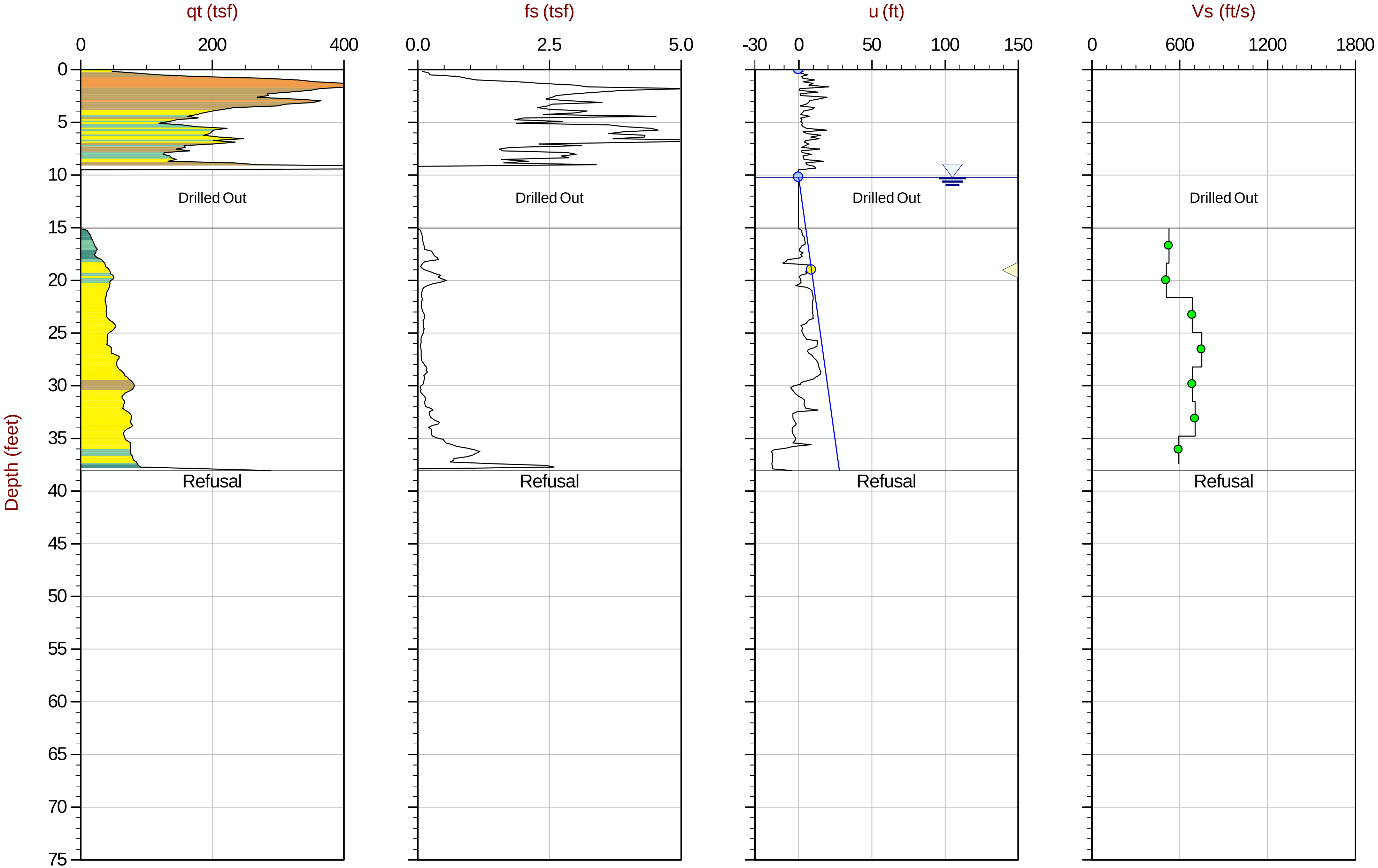
Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
16.08	15.42	15.55			
19.36	18.70	18.80	3.26	8.23	396
22.64	21.98	22.07	3.27	11.83	276
25.92	25.26	25.34	3.27	10.94	299
29.20	28.54	28.61	3.27	5.53	592
32.48	31.82	31.88	3.27	5.79	566
35.76	35.10	35.16	3.28	4.16	787
39.04	38.39	38.44	3.28	4.78	686
42.32	41.67	41.71	3.28	5.61	584
45.60	44.95	44.99	3.28	6.26	523
48.88	48.23	48.27	3.28	5.41	606
52.17	51.51	51.55	3.28	4.15	790
55.45	54.79	54.83	3.28	3.86	849
58.73	58.07	58.10	3.28	4.07	806
62.01	61.35	61.38	3.28	3.01	1090

CONETEC

Langan Engineering

Job No: 17-53134
Date: 2017-10-18 12:02
Site: 76 Varick Street, Manhattan, NY

Sounding: SCPT17-03
Cone: 495:T1500F15U500



Max Depth: 11.600 m / 38.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53134_SP03.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4508440m E: 583969m

— Hydrostatic Line ○ Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

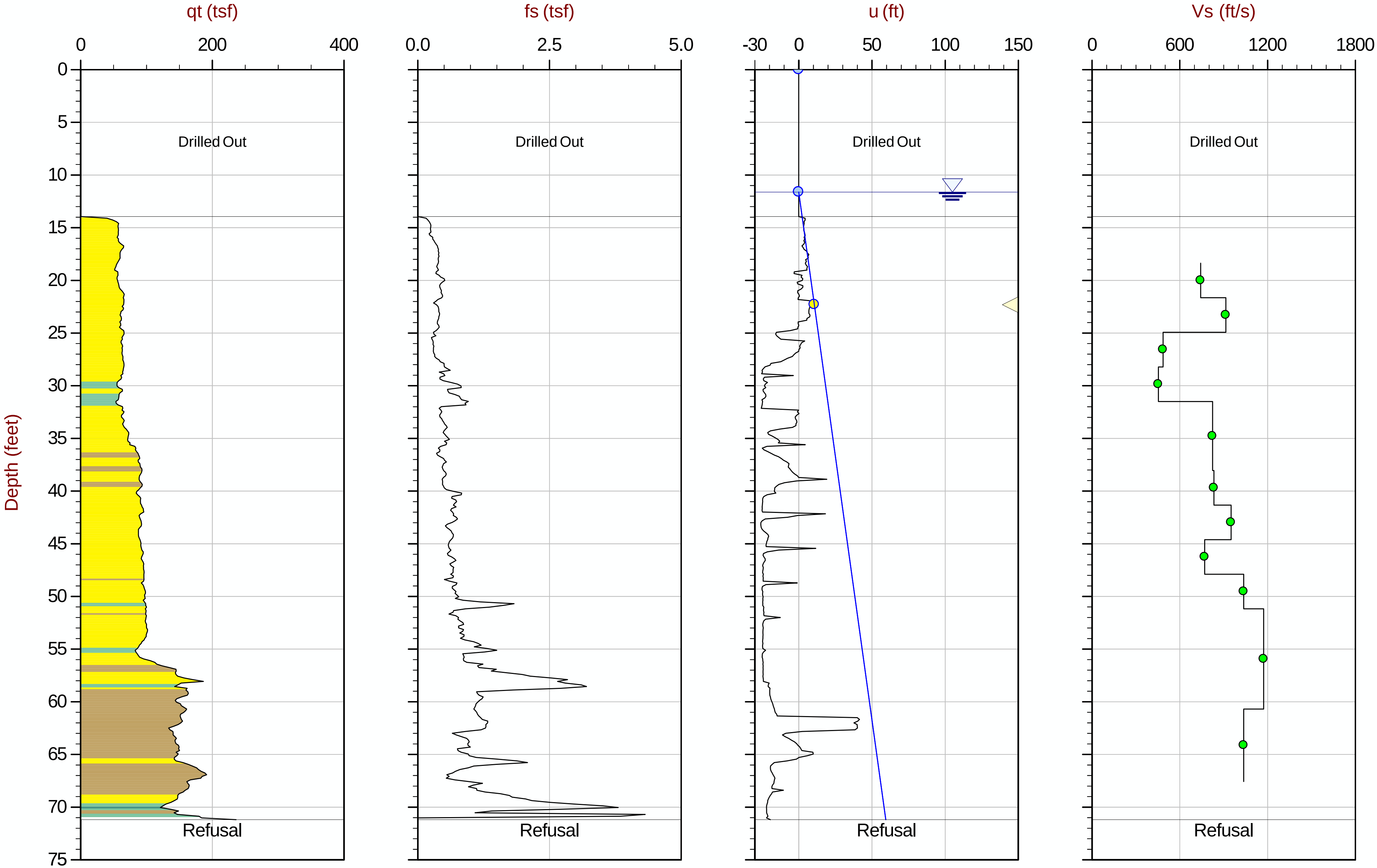
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Langan Engineering

Job No: 17-53134
Date: 2017-10-18 13:20
Site: 76 Varick Street, Manhattan, NY

Sounding: SCPT17-04
Cone: 495:T1500F15U500



Max Depth: 21.700 m / 71.19 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53134_SP04.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4508439m E: 583941m

— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ATTACHMENT C

Laboratory Results

Langan Engineering #170470001
76 Varick St
LABORATORY TESTING DATA SUMMARY

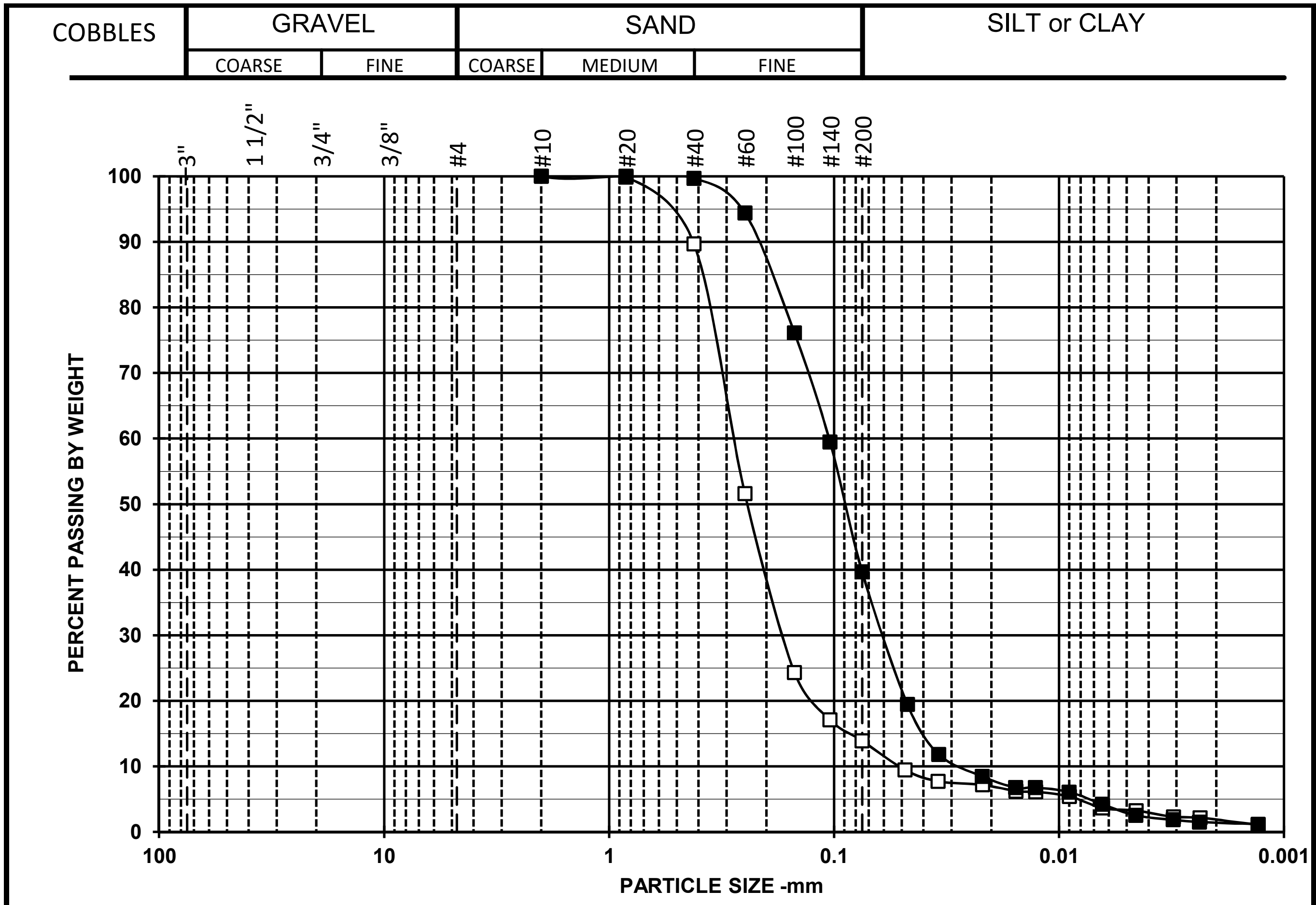
BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS							REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDROMETER % MINUS 2 μm (%)	
LB-1	S-10	30-32	27.3				SM	13.9	2	
LB-1	S-13	45-47	29.6				SM	39.7	1	
LB-3	S-6	10-12	20.6				SM	16.9		
LB-3	S-10	25-27	28.2	24	20	4	CL-ML	78.8		
LB-11	S-15	55-57	22.8				ML	59.2	4	

Note: (1) USCS symbol based on visual observation and Sieve and Atterberg limits reported.

Prepared by: NG
Reviewed by: CMJ
Date: 7/7/2017

TerraSense, LLC
45H Commerce Way
Totowa, NJ 07512

Project No.: 7920-744
File: Indx1.xlsx



Symbol	□	■	○
Boring	LB-1	LB-1	
Sample	S-10	S-13	
Depth	30-32	45-47	
% +3"	0.0	0.0	
% Gravel	0.0	0.0	
% SAND	86.1	60.3	
%C SAND	0.0	0.0	
%M SAND	10.3	0.3	
%F SAND	75.8	60.0	
% FINES	13.9	39.7	
D_{100} (mm)	2.000	2.000	
D_{60} (mm)	0.279	0.105	
D_{30} (mm)	0.167	0.060	
D_{10} (mm)	0.051	0.027	
Cc	2.000	1.300	
Cu	5.5	3.9	

Sieve Size/ID #	Percent Finer Data		
6"			
4"			
3"			
1 1/2"			
1"			
3/4"			
1/2"			
3/8"			
#4			
#10	100.0	100.0	
#20	99.9	100.0	
#40	89.7	99.7	
#60	51.6	94.4	
#100	24.3	76.1	
#140	17.1	59.5	
#200	13.9	39.7	
5μ m	3	3	
2μ m	2	1	
1μ m	1	1	

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	27.3				SM		Brown, Silty sand	06/29/17
■	29.6				SM		Brown, Silty sand	06/29/17
○								

Langan Engineering #170470001

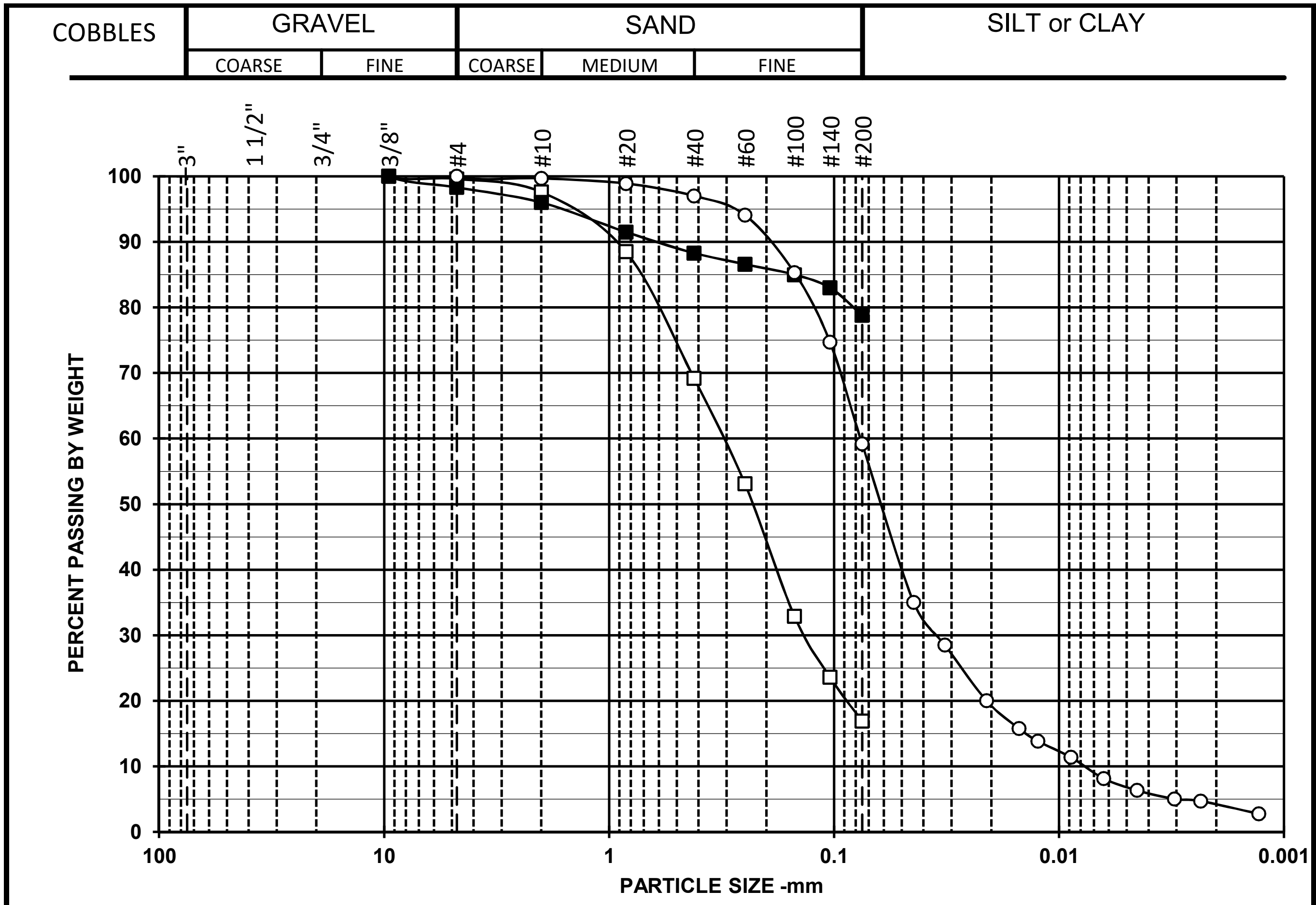
TerraSense, LLC #7920-744

76 Varick St

PARTICLE SIZE DISTRIBUTION

TerraSense Analysis File: GrainSizeV4R2f(6/17)

Siev1a.xlsx 7/7/2017



Symbol	□	■	○
Boring	LB-3	LB-3	LB-11
Sample	S-6	S-10	S-15
Depth	10-12	25-27	55-57
% +3"	0.0	0.0	0.0
% Gravel	0.4	1.7	0.0
% SAND	82.7	19.5	40.8
%C SAND	2.0	2.3	0.3
%M SAND	28.4	7.7	2.7
%F SAND	52.3	9.5	37.8
% FINES	16.9	78.8	59.2
D_{100} (mm)	9.530	9.530	4.750
D_{60} (mm)	0.311		0.076
D_{30} (mm)	0.134		0.035
D_{10} (mm)			0.008
Cc			2.000
Cu			10.0

Sieve Size/ID #	Percent Finer Data		
6"			
4"			
3"			
1 1/2"			
1"			
3/4"			
1/2"			
3/8"	100.0	100.0	
#4	99.6	98.3	100.0
#10	97.6	96.0	99.7
#20	88.5	91.5	98.9
#40	69.2	88.3	97.0
#60	53.1	86.6	94.1
#100	32.9	85.0	85.3
#140	23.6	83.0	74.7
#200	16.9	78.8	59.2
5μ m			7
2μ m			4
1μ m			2

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	20.6				SM		Brown, Silty sand	06/29/17
■	28.2	24	20	4	CL-ML		Grayish brown, Silty clay with sand	06/29/17
○	22.8				ML		Brown, Sandy silt	06/29/17

Langan Engineering #170470001

TerraSense, LLC #7920-744

76 Varick St

PARTICLE SIZE DISTRIBUTION

TerraSense Analysis File: GrainSizeV4R2f(6/17)

Siev1b.xlsx 7/7/2017